EPSON



EPSON RC+ Option Fieldbus I/O Rev.6

EPSON RC+ Option

Fieldbus I/O

Rev.6

Copyright © 2005-2007 SEIKO EPSON CORPORATION. All rights reserved.

FOREWORD

This manual contains important information necessary to use the EPSON RC+ option Fieldbus I/O properly and safely. This manual is intended for personnel who perform any operations that use the pendant, such as teaching robot points.

Please thoroughly read this and other related manuals before and while using the equipment.

WARRANTY

The robot and its optional parts are shipped to our customers only after being subjected to the strictest quality controls, tests, and inspections to certify its compliance with our high performance standards.

Product malfunctions resulting from normal handling or operation will be repaired free of charge during the normal warranty period. (Please ask your Regional Sales Office for warranty period information.)

However, customers will be charged for repairs in the following cases (even if they occur during the warranty period):

- 1. Damage or malfunction caused by improper use which is not described in the manual, or careless use.
- 2. Malfunctions caused by customers' unauthorized disassembly.
- 3. Damage due to improper adjustments or unauthorized repair attempts.
- 4. Damage caused by natural disasters such as earthquake, flood, etc.

Warnings, Cautions, Usage:

- 1. If the robot or associated equipment is used outside of the usage conditions and product specifications described in the manuals, this warranty is void.
- 2. If you do not follow the WARNINGS and CAUTIONS in this manual, we cannot be responsible for any malfunction or accident, even if the result is injury or death.
- 3. We cannot foresee all possible dangers and consequences. Therefore, this manual cannot warn the user of all possible hazards.

TRADEMARKS

Microsoft, Windows, and Windows logo are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. Other brand and product names are trademarks or registered trademarks of the respective holders.

TRADEMARK NOTATION IN THIS MANUAL

Microsoft® Windows® 2000 Operating system

Microsoft® Windows® XP Operating system

Throughout this manual, Windows 2000, and Windows XP refer to above respective operating systems. In some cases, Windows refers generically to Windows 2000, and Windows XP.

NOTICE

No part of this manual may be copied or reproduced without authorization. The contents of this manual are subject to change without notice. Please notify us if you should find any errors in this manual or if you have any comments regarding its contents.

INQUIRIES

Contact the following service center for robot repairs, inspections or adjustments. If service center information is not indicated below, please contact the supplier office for your region.

Please prepare the following items before you contact us.

- Your controller model and its serial number
- Your manipulator model and its serial number
- Software and its version in your robot system
- A description of the problem

SERVICE CENTER

MANUFACTURER & SUPPLIER

Japan & Others

SEIKO EPSON CORPORATION

Suwa Minami Plant Factory Automation Systems Dept. 1010 Fujimi, Fujimi-machi, Suwa-gun, Nagano, 399-0295 JAPAN TEL : +81-266-61-1802 FAX : +81-266-61-1846

SUPPLIERS

North & South America EPSON AMERICA, INC.

Factory Automation/Robotics 18300 Central Avenue Carson, CA 90746 USA TEL : +1-562-290-5900 FAX : +1-562-290-5999 E-MAIL : info@robots.epson.com

Europe EPSON DEUTSCHLAND GmbH

Factory Automation Division Otto-Hahn-Str.4 D-40670 Meerbusch Germany TEL : +49-(0)-2159-538-1391 FAX : +49-(0)-2159-538-3170 E-MAIL : robot.infos@epson.de

Before Reading This Manual

This section describes what you should know before reading this manual.

Safety Precautions

Installation and transportation of robots and robotic equipment shall be performed by qualified personnel and should conform to all national and local codes.

Please carefully read this manual and other related manuals before installing the robot system or before connecting cables.

Keep this manual handy for easy access at all times. Please read the Safety chapter in User's Guide to understand safety requirements before installing the robot system.

Conventions

Important safety considerations are indicated throughout the manual by the following symbols. Be sure to read the descriptions shown with each symbol.

WARNING	This sign indicates that a danger of serious injury or death will exist if those instructions are not followed.
WARNING	This sign indicates that a danger of possible harm to people caused by electric shock will exist if those instructions are not followed.
	This sign indicates that ignoring these instruction may cause harm to people or physical damage to equipment and facilities.

1. Introduction	1
1.1 Overview of Fieldbus I/O	1
1.2 DeviceNet	2
Overview of DeviceNet	2
Features of DeviceNet	2
General Specifications	4
1.3 PROFIBUS DP	5
Overview of PROFIBUS DP	5
Features of PROFIBUS DP	5
General Specifications	7
1.4 EtherNet/IP	8
Overview of EtherNet/IP	8
Features of EtherNet/IP	8
General Specifications	10
2. Installation	11
2.1 How to Setup a DeviceNet Network	11
2.2 DeviceNet Network Construction	12
2.3 How to Setup a PROFIBUS DP Network	19
2.4 PROFIBUS DP Network Construction	20
2.5 How to Setup a EtherNet/IP Network	24
2.6 EtherNet/IP Network Construction	25
2.7 DeviceNet Board Installation	
2.7.1 Board Appearance	
2.7.2 Specifications	27
2.7.3 Software Installation	27
2.7.4 Board Installation	29
2.7.5 Master Mode	31
2.7.6 Slave Mode	37
2.8 PROFIBUS DP Board Installation	41
2.8.1 Board Appearance	41
2.8.2 Specifications	42
2.8.3 Software Installation	42
2.8.4 Board Installation	
2.8.5 Master Mode	
	51 בס
2.0.1 GOD FIRE	

	2.9 DeviceNet Board Installation	54
	2.9.1 Board Appearance	54
	2.9.2 Specifications	54
	2.9.3 Software Installation	55
	2.9.4 Board Installation	57
	2.9.5 Master Mode	60
	2.9.6 Slave Mode	64
	2.10 EPSON RC+ Fieldbus I/O Installation	67
	Fieldbus I/O Software Configuration	67
3	. Operation	69
	3.1 Fieldbus I/O Addressing in SPEL+	69
	3.2 SPEL+ Fieldbus I/O Commands	69
	3.3 Outputs Off by Emergency Stop and Reset Instruction	70
	3.4 Waiting for Input or Output Status	70
	3.5 Using FbusIO_SendMsg	71
	3.6 Using Slave Mode	72
	3.7 Remote Control Slave	72
	3.8 Devices available for Fieldbus I/O Option	73
	3.9 Fieldbus I/O Response Performance	73
	DeviceNet	73
	PROFIBUS DP	75
4	. Troubleshooting	77
	4.1 DeviceNet Troubleshooting	77
	Exclusion	77
	Tools	77
	4.1.1 Examining a Problem	78
	4.1.2 Problems and Countermeasures	80
	4.1.3 Procedures for Examining Possible Causes	98
	4.2 PROFIBUS DP Troubleshooting	111
	Exclusion	111
	Tools	111
	4.2.1 Examining a Problem	112
	4.2.2 Problems and Countermeasures	114
	4.2.3 Procedures for Examining Possible Causes	130
	4.3 EtherNet/IP Troubleshooting	140
	Exclusion	140
	4.3.1 Examining a Problem	141
	4.3.2 Propedures for Examining Describe Courses	143
		144

5. Maintenance Parts List	. 151
Appendix A applicomIO Upgrade	. 153

1. Introduction

1.1 Overview of Fieldbus I/O

The Fieldbus I/O option is an integrated I/O system that supports DeviceNet, PROFIBUS DP, and EtherNet/IP fieldbuses.

A fieldbus is a standard of signal communications between field devices operating in a factory (sensor, actuator, robot controller, etc.) and controller (PLC or robot controller) using serial communications. Compared to signal communications using analog signals, a fieldbus has the following features:

- Access to signals from multiple devices and multiple data from each device using one cable.
- Precise signal transmission since there is no need for A/D conversion and D/A conversion.
- Less wiring costs, including signal relay board costs and installation area due to several dozen (or a hundred) devices connected on one fieldbus.
- More flexible modification and expansion of a system because multiple devices are simply added to one fieldbus without additional wiring.
- Slave devices can transmit self-diagnostics information.



For each fieldbus on the RCxxx controller, there is at least one board installed. You can use more that one fieldbus type on the same controller. You can also use multiple boards for the same fieldbus type. The EPSON RC+ software key Fieldbus I/O Option must be enabled to use this option.



Response times for Fieldbus I/O can vary and depend on several factors, including baud rate, scan rate, number and types of devices, number of SPEL+ tasks, etc. When the fastest and most consistent response times are required, please use EPSON standard digital I/O, which incorporates interrupt driven inputs and outputs.

1.2 DeviceNet

Overview of DeviceNet

DeviceNet is a fieldbus network that provides easy interconnection between control devices (PLC, PC, sensor, actuator, etc.).

DeviceNet was developed by Allen-Bradley as an open communication standard to connect various field devices (sensor, actuator, robot controller, etc.). Because of the open communication standard, DeviceNet users can easily construct a multi-vendor system with various devices developed around the world.



Features of DeviceNet

Reduced Wiring

Compared with parallel wiring, DeviceNet employs a dedicated 5-wire cable (signal wires and power wires) which substantially reduces the number of necessary wires, wiring time and cost.

Detachable communication connectors provide you with simple wiring between nodes and easy network separation or reconstruction.

Specified environment-resistance cables allow you to construct an environment-resistant system at low cost.

Open Standard (Multi-vendor)

Due to an open communication standard, various devices from many manufacturers are available. Standardized communication connectors provide you with easy network construction.

The maintenance spare parts stored on site (factory, etc.) can be reduced because different manufacturers' devices are used in case of a breakdown. Similar products are available around the world due to a global standard DeviceNet.

Large Numbers of Inputs/Outputs

For EPSON RC+ standard I/O and expansion I/O, the number of inputs/outputs is limited to 512 inputs and 512 outputs. When configuring a device to be a master of fieldbus I/O, you can control more than 16,000 total inputs and outputs. For a slave device, 2,040 inputs (255 bytes) and 2,040 outputs (255 bytes) are available.

Different Connection Types

There are two messaging connections: I/O messaging connection and explicit messaging connection. The I/O messaging connection includes polling, strobe, cyclic, and change of state. I/O messaging connections are explained below:

- Polling: First, a master device sends output data to a slave device and then the slave device responds. Data is normally exchanged in every communication cycle. The communication frequency can be changed by setting. This connection type is the most often used.
- Strobe: First, a master device requests slave devices to send data with multicast messages, and then, each slave device responds separately.Data from many sensors on the system can be effectively gathered. When the master does not receive responses from all requested slave devices, a timeout error occurs.

Change Of State:

A device sends data whenever it changes. Signals for device diagnosis are sent regularly in the background. This connection type is useful for remedying DeviceNet communication traffic.

Cyclic: A slave device transfers data regularly according to its internal timer. This connection type is typically used for communicating with a temperature controller. The data transfer frequency is defined by master configuration.

NOTE

For Change of State and Cyclic, you can disable the ACK that is for verifying that communication is completed. Never disable ACK, since communication errors cannot be detected.

Functions of Master

The Master device gathers and controls all nodes on one network.

A DeviceNet master can control up to 64 nodes (max. 2 kbytes) on one network.

A PLC is typically configured as a master and controls all nodes in factory automation system, but EPSON RC+ is also capable of being a master.

DeviceNet network configuration is specified by configuration management software. This software is normally provided by a master device manufacturer. The configuration management software determines parameters for each slave device via an Electronic Data Sheet (EDS).

Available connection types are Polling, Strove, Cyclic, Change Of State, and explicit messaging.

Available baud rates are 125 kbps, 250 kbps, and 500 kbps.

Functions of Slave

A slave can exchange data with a master device.

The configuration management software identifies parameters of each slave device via Electronic Data Sheet (EDS) where the parameters are registered.

Available connection types are Polling, Strobe, Cyclic, and Change of State.

Available baud rates are 125 kbps, 250 kbps, and 500 kbps.

General Specifications

Electrical Specifications

Item	Specification	
Supply Voltage	5 V DC (supplied from a controller)	
Power Consumption	7 W	
Ambient Temperature	5-40 deg C	
Relative Humidity	20-80%	

DeviceNet Communication Specifications

Item	Specification			
Supported Connection	- I/O messaging connection			
	(Polling, S	Strove, Cyclic, Ch	ange of State)	
	- Explicit me	essaging connection	on	
	All connection	ons are conformed	d to DeviceNet	communication
	protocol.			
Baud Rates	125 kbps, 25	0 kbps, 500 kbps		
Transfer Distance	Baud Rates	Max. Network Length	Drop Length	Total Drop Line Length
	500 kbps	100 m	6 m or under	39 m or under
	250 kbps	250 m *	6 m or under	78 m or under
	125 kbps	500 m *	6 m or under	156 m or under
Maximum Nodes	64 (including master unit)			
Data Length / Frame	8 byte (The data can be divided and transferred.)			
Bus Access	CSMA/NBA			
Error Detection	CRC error / Duplicate node address check			
Cable	5-wire cable dedicated to DeviceNet (2 wires for signal,			
	2 wires for power supply, 1 shield wire)			
Communications	24 V DC (supplied from a connector)			
Power Supply Voltage				

* When thin cable is used for trunk line, the maximum network length is 100 m.

1.3 PROFIBUS DP

Overview of PROFIBUS DP

PROFIBUS DP is one of fieldbus networks that provide easy interconnection between control devices (PLC, PC, sensor, actuator, etc.).

PROFIBUS DP was co-developed by Siemens, Bosch, and ABB as an open communication standard to connect various field devices (sensor, actuator, robot controller, etc.). Because of the open communication standard, PROFIBUS DP can easily construct multi-vendor system with various devices developed around the world.



Features of PROFIBUS DP

Reduced Wiring

Compared with a parallel wiring, PROFIBUS DP employing dedicated 2-wire cable substantially reduces the number of necessary wires, wiring time and cost.

Detachable communication connector provides you a simple wiring between devices (stations) and an easy network separation or reconstruction.

Fast Communication

PROFIBUS DP communication speed can be set up to 12Mbps. This is faster than DeviceNet, another communication standard supported by the fieldbus I/O.

Open Standard (Multi-vendor)

Due to an open communication standard, various devices from many manufacturers are available. Standardized communication connectors allow you to reconstruct your network easily.

The sort of maintenance parts stored on site (factory, etc.) can be reduced because different manufacturers' devices are used in case of a breakdown. Similar products are available around the world due to a global standard PROFIBUS DP.

Large Numbers of Inputs/Outputs

For the standard I/O and expansion I/O, the number of inputs/outputs is limited to up to 512 inputs and 512 outputs. When configuring a device to be a master of fieldbus I/O, you can control more than 16,000 total inputs and outputs.

For a slave device, 1,952 inputs (244 bytes) and 1,952 outputs (244 bytes) are available.

Functions of Master

There are two types of PROFIBUS DP master: DPM1 and DPM2. DPM1 (DP Master Class 1) gathers and controls all stations on one PROFIBUS DP network. DPM2 (DP master Class 2) operates network configurations, network maintenance, and diagnosis.

PROFIBUS DP master can control up to 126 stations (max. 2 kbytes) on one network.

A PLC is typically configured as a master and controls all devices in factory automation system, but EPSON RC+ is also capable of being a master.

PROFIBUS DP network configuration is specified by configuration management software. This software is normally provided by a master device manufacturer. The configuration management software determines parameters for each slave device via an Electronic Data Sheet (GSD).

The connection type is token passing procedure and master-slave communication. The token passing procedure is applied to the PROFIBUS DP network with more than two master devices to transfer network control between masters. The master-slave communication is applied to the communication between the master device with network control and its slave devices.

Available baud rates are 9.6 kbps, 19.2 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1500 kbps, 3 Mbps, 6 Mbps, and 12 Mbps.

Functions of Slave

A slave can exchange data with a master device.

The configuration management software identifies parameters of each slave device via an electronic data sheet (GSD) file where the parameters are registered.

The communication type is a cyclic master-slave communication.

The input/output data of each station is up to 244 bytes.

Available baud rates are 9.6 kbps, 19.2 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1500 kbps, 3 Mbps, 6 Mbps, and 12 Mbps.

General Specifications

Electrical Specifications

Item	Specification	
Supply Voltage	5 V DC (supplied from a controller)	
Power Consumption	5.5 W	
Ambient Temperature during Operation	5-40 deg C	
Relative Humidity during Operation	20-80%	

PROFIBUS DP Communication Specifications

Item	Specification		
Connection Method	Hybrid		
	(token passing procedure and	master-slave communication)	
Baud Rates	9.6 kbps, 19.2 kbps, 93.75 kb	ps, 187.5 kbps, 500 kbps,	
	1500 kbps, 3 Mbps, 6 Mbps, a	and 12 Mbps.	
Transfer Distance	Baud Rates	Cable Length	
	12 Mbps	100 m	
	6 Mbps	100 m	
	3 Mbps	100 m	
	1500 kbps	200 m	
	500 kbps 400 m		
	187.5 kbps 1000 m		
	93.75 kbps 1200 m		
	19.2 kbps 1200 m		
	9.6 kbps	1200 m	
Maximum Stations	126 (including master unit and repeater)		
Data Length / Frame	244 bytes		
Cable	2-wire cable dedicated to PROFIBUS (2 wires for signal)		

1.4 EtherNet/IP

Overview of EtherNet/IP

EtherNet/IP is a fieldbus network that provides easy interconnection between control devices (PLC, PC, sensor, actuator, etc.).

EtherNet/IP was developed by Allen-Bradley as an open communication standard to connect various field devices (sensor, actuator, robot controller, etc.). Because of the open communication standard, EtherNet/IP users can easily construct a multi-vendor system with various devices developed around the world.



Features of EtherNet/IP

Reduced Wiring

Compared with parallel wiring, EtherNet/IP employs a standard Ethernet cable which substantially reduces the number of necessary wires, wiring time and cost.

Detachable communication connectors provide you with simple wiring between nodes and easy network separation or reconstruction.

Specified environment-resistance cables allow you to construct an environment-resistant system at low cost.

NOTE

You can use the generic Ethernet hub or Ethernet switch for the EtherNet/IP. However, be sure to a use product complying with the industrial standards or noise resistant Ethernet cable (STP cable). If you use an office use product or UTP cable, it may causes communication errors and may not offer the proper performance.

Open Standard (Multi-vendor)

Due to an open communication standard, various devices from many manufacturers are available. Standardized communication connectors provide you with easy network construction.

The maintenance spare parts stored on site (factory, etc.) can be reduced because different manufacturers' devices are used in case of a breakdown. Similar products are available around the world due to a global standard EtherNet/IP.

Large Numbers of Inputs/Outputs

For EPSON RC+ standard I/O and expansion I/O, the number of inputs/outputs is limited to 512 inputs and 512 outputs. When configuring a device to be a master of fieldbus I/O, you can control more than 16,000 total inputs and outputs.

For a slave device, 4,040 inputs (505 bytes) and 4,072 outputs (509 bytes) are available.

Different Connection Types

There are two messaging connections: I/O messaging connection and explicit messaging connection. The I/O messaging connection includes cyclic and change of state. I/O messaging connections are explained below:

Change Of State:

A device sends data whenever it changes. Signals for device diagnosis are sent regularly in the background. This connection type is useful for remedying EtherNet/IP communication traffic.

Cyclic: A slave device transfers data regularly according to its internal timer. This connection type is typically used for communicating with a temperature controller. The data transfer frequency is defined by master configuration.

NOTE

For Change of State and Cyclic, you can disable the ACK that is for verifying that communication is completed. Never disable ACK, since communication errors cannot be detected.

Functions of Master

The Master device gathers and controls all nodes on one network.

A EtherNet/IP master can control up to 127 nodes (max. 14 kbytes) on one network.

A PLC is typically configured as a master and controls all nodes in factory automation system, but EPSON RC+ is also capable of being a master.

EtherNet/IP network configuration is specified by configuration management software. This software is normally provided by a master device manufacturer. The configuration management software determines parameters for each slave device via an Electronic Data Sheet (EDS).

Available connection types are Cyclic, Change Of State, and explicit messaging.

Available baud rates are 100 Mbps and 10 Mbps. (auto-detect)

Functions of Slave

A slave can exchange data with a master device.

The configuration management software identifies parameters of each slave device via Electronic Data Sheet (EDS) where the parameters are registered.

Available connection type is Cyclic.

Available baud rates are 100 Mbps and 10 Mbps. (auto-detect)

General Specifications

Electrical Specifications

Electrical opecifications			
Item	Specification		
Supply Voltage	5 V DC (supplied from a controller)		
Power Consumption	5.5 W		
Ambient Temperature	5-40 deg C		
Relative Humidity	20-80%		

EtherNet/IP Communication Specifications

Item	Specification	
Supported Connection	- I/O messaging connection	
	(Cyclic, Change of State)	
	- Explicit messaging connection	
	All connections are conformed to EtherNet/IP communication	
	protocol.	
Baud Rates	100 Mbps, 10 Mbps	
Maximum Nodes	128 (including master unit)	
Data Length / Frame	244 bytes	
Access Control Type	CSMA/CD	
Cable	Universal Ethernet cable	

2. Installation

This chapter contains procedures for installing a DeviceNet, PROFIBUS DP, or EtherNet/IP network. Refer to the sections that correspond to the type of network you are installing.

2.1 How to Setup a DeviceNet Network

The following is a basic procedure for setting up a DeviceNet network:

- 1. Choose node distribution and distribution route on your network. For details, refer to the following section 2.2 *DeviceNet Network Construction*.
- 2. Choose power supply method for communication. For details, refer to the following section 2.2 DeviceNet Network Construction.
- Choose baud rate. Choose the baud rate based on the network length. Select the fastest baud allowed for the length. Increasing network load due to slow baud rate may cause trouble including communication failure.
- 4. Lay cables. For details, refer to the following section 2.2 DeviceNet Network Construction.
- 5. Configure nodes. For details, refer to respective manuals of your desired nodes.
- 6. Turn ON the communications power supply and nodes. Turn ON the communications power supply. After that or simultaneously, turn ON the nodes to supply power. When the power to the nodes is supplied earlier than the power to the communications power supply, communication with the nodes may fail.
- 7. Install the scanner board in your controller. Refer to the section 2.7 *DeviceNet Board Installation* later in this chapter.
- Configure a master and slaves. Use the configuration management software for configuring a master and slaves (scan list). For details, please refer to the configuration management software manual. To configure EPSON RC+ as a master, refer to the section 2.7 DeviceNet Board

Installation later in this chapter.

- Configure EPSON RC+. Refer to the section 2.10 EPSON RC+ Fieldbus I/O Installation later in this chapter.
- 10. Operate the DeviceNet network.

2.2 DeviceNet Network Construction

Network Configuration

A DeviceNet network is configured as shown in the following figure.



Node

There are two types of the node: master and slave. The master controls a network and gathers data from its slaves. The slaves, including external I/O and other devices, output data in response to the master's output order and informs the master of its input status.

You can install masters anywhere in the network. You can connect up to 64 nodes (including the master) on your network.

Trunk Line and Drop Line

A trunk line is a backbone cable of DeviceNet network with a terminating resistor on the both ends.

A drop line is a branch of the trunk line.



For DeviceNet, 5-wire cables are used for trunk lines and drop lines. The DeviceNet cables on the market can be used for such cables. There are two types of the DeviceNet cable: Thick cable and Thin cable. Environment-resistant cable and flexible cable are available. For details of cables, see ODVA's Web site (http://www.odva.org/).



Wire Type	Color	Details of Signal	Wire Identity
Signal wire	Blue	Signal Low	CAN L
Signal wite	White	Signal High	CAN H
Dower wire	Red	Communications Power Positive	V+
Power whe	Black	Communications Power Negative	Ũ
Shield wire	-	Shield	S

Terminating Resistor

To reduce reflections of communication signal, terminating resistors should be attached on both ends of the trunk line. For DeviceNet, nodes have no terminating resistor on the ends.

Attach 121 Ω +/-1%, 1/4W terminating resistors between the signal wires (CAN-H and CAN-L) of the trunk line cable. Some T-branch taps and connectors can accept terminal resistors. Molded terminating resistors with connectors are also available to attach to environment-resistant T-branch taps and connectors.

Node Connection

Nodes can be connected to a DeviceNet network by the following topologies: tree, multi-drop, T-branch, daisy chain. For tree topology, there is no limitation of daisy chain layer but drop line length is limited. For details of drop line length, refer to the following section "Drop Line Length".



Communications Power Supply

DeviceNet supplies 24V DC communications power to each node via 5-wire cables. You can install the communications power supply at any location on the DeviceNet network. We recommend providing a dedicated communications power supply on the network separately even though it is possible to share power among the communications power supply, node internal circuit power supply, and I/O power supply.

Shield Ground of Signal Wire

Ground the DeviceNet network at one point with 100 Ω or less. As a noise countermeasure, you can leave the network ungrounded. For details, refer to the 4. *Troubleshooting*.

Maximum Network Length (Maximum Trunk Length)

The maximum network length is the longest distance either between terminating resistors or between the two most distant nodes on the network.



The maximum network length is restricted by the type of cable and the baud rate.

Baud Rate	Maximum Network Length		
Dada Nate	Thick Cable	Thin Cable	
500 kbps	100 m	100 m	
250 kbps	250 m	100 m	
125 kbps	500 m	100 m	

Both Thick Cable and Thin Cable can be combined and used for trunk lines. In this case, the maximum network length is calculated using the following formulas.

Baud Rate	Maximum Network Length
500 kbps	Thick Cable Length + Thin Cable Length ≤ 100 m
250 kbps	Thick Cable Length + 2.5 × Thin Cable Length \leq 250m
125 kbps	Thick Cable Length + $5.0 \times$ Thin Cable Length ≤ 500 m

Drop Line Length

The drop line length is the distance from a branch on the trunk line to the end of that branch.



In figure above, each drop line length is as follows: Drop Line to Node 1: 4 m Drop Line to Node 2: 6 m Drop Line to Node 3: 6 m

One drop line length should be 6m or less.

Total Drop Line Length

The total drop line length is the total distance of all drop lines on one network.



In the figure above, the total drop line length is 17 m.

The maximum total drop line length is restricted by baud rate as shown in the table below. The cable thickness is not related to the restriction.

Baud Rate	Max. Total Drop Line Length
500 kbps	39 m
250 kbps	78 m
125 kbps	156 m

Cable Current Capacity

The current-carrying capacity of the DeviceNet network cable is restricted as shown below:

	Trunk Line		Drop Line (Linit: A)
	Thick Cable	Thin Cable	Drop Line (Onit. A)
Current Capacity	8A	3A	4.57 / Drop Line Length (m) \leq 3A

The following figures illustrate power supply configuration examples.

When an external power supply is installed on the network as shown in the figure below, the current capacity is 11A and it exceeds the permissible current of the cable.



If the location of the external power supply is changed on the network as shown in the figure below, the power supply can be used on the network because the current capacity on the left side of the power supply tap is 5 A and that on the right side is 6 A.



If the current capacity consumed on the network exceeds the restriction of cable current capacity, it is possible to install more than one power supply on the network. If you attempt to install two or more power supplies on the network, take necessary measures (pulling out a fuse on the power supply tap, etc.) to avoid conflicts between power outputs from multiple power supplies.



The following figure illustrates a sample wiring. An OMRON power supply tap is shown in the figure.



Procedure for Modifying and Installing Communication Cables

Follow the steps described below to modify communication cables and connect them to connectors.

Be careful not to injure your hands or fingers on any sharp blades or tools used to modify the cable.
Use appropriate blades and/or other tools to modify the cable. Using inappropriate blades and/or other tools may result in bodily injury and/or equipment damage.

 Strip approx. 30 mm of the cable covering with extra care so that you do not scratch on the braided shield underneath. Do not strip the cable covering more than necessary. Excess stripping may cause short-circuit and/or make the cable more sensitive to noise.



CAUTION

- (2) Carefully expand the meshes of the braided shield. Under the braided shield, there is one exposed bare twisted shield wire other than the signal wires and power wires that are wrapped with aluminum tape. The shield wire is slightly harder than the mesh.
- (3) Cut off the expanded braided shield and remove the aluminum tape around the signal wires and power wires. Then, strip the insulation from the signal wires and power wires for a length sufficient to connect them to crimp terminals.

Twist each stripped signal wire and power wire.

(4) Set the crimp terminal on the stripped part of the wire and crimp it with a crimp tool. The following crimping terminals are recommended products.





Peel the coverings in enough length to connect the wires to crimping terminals.



NICHIFU TC series

Model Number	Specifications	Special Tool
TMEV TC-0.5	For Thin Cable	
TMEV TC-2-11	For Thick Cable (power wire)	MH-32
TMEV TC-1.25-11	For Thick Cable (signal wire)	

Phoenix Contact AI series

Model Number	Specifications	Special Tool
AI 0.5-8WH	For Thin Cable (power cable)	
AI 0.25-8YE	For Thin Cable (signal wire)	CRIMPEON LIDE
AI 2.5-8BU	For Thick Cable (signal wire)	CRIMITOR UD0
AI 1-8RD	For Thick Cable (signal wire)	

(5) Wrap or cover the cable with vinyl tape or heat-shrink tubing.



NOTE

Loosen the screws securing the cables on the connector. If the screws are not loosened, the wires go into different openings on the rear of connector instead of the correct openings and the wires cannot be secured.

(6) Ensure the correct connector orientation and insert the signal wires and shield wire to their respective holes on the connector.

As shown in the figure, insert the wires (black, blue, shield, white, and red) into the holes in the order named.

The following table shows the specified colors of the cables.

	Color	Details of Signal	Wire Identity
a	Black	Communications Power Supply (negative)	V-
b	Blue	Signal (Low)	CAN L
с	-	Shield	S
d	White	Signal (High)	CAN H
e	Red	Communications Power	V+
		Supply (positive)	



(7) Tighten each screw securing the wires on the connector. Tighten the screw securing the wire at a correct tightening torque (0.25 to 0.3 N·m). To prevent thick cable from coming out due to cable tension, install enough thick cable length to allow for stretch. Use a small flat blade screwdriver that has the correct width and thickness. If you use a typical screwdriver

whose point is narrow, you cannot deeply insert it into the hole on the connector. Specific screwdriver for DeviceNet connector screw:

OMRON : XW4Z-00C

Phoenix Contact : SZF-1 0.6×3.5



2.3 How to Setup a PROFIBUS DP Network

The following is a basic procedure for setting up a PROFIBUS DP network:

- 1. Choose station distribution and distribution route on your network. For details, refer to the following section 2.4 PROFIBUS DP Network Construction.
- Choose baud rate. Choose the baud rate based on the network length. Select the fastest baud rate allowed for the length. Increasing network load due to slow baud rate may cause trouble including communication failure.
- 3. Lay cables. For details, refer to the following section 2.4 PROFIBUS DP Network Construction.
- 4. Configure stations. For details, refer to respective manuals of your desired stations.
- 5. Turn ON the stations.
- 6. Install the scanner board in your controller. Refer to the section 2.8 PROFIBUS DP Board Installation later in this chapter.
- Configure a master and slaves. Use the configuration management software for configuring a master and slaves (scan list). For details, please refer to the configuration management software manual.

To configure EPSON RC+ as a master, refer to the section 2.8 *PROFIBUS DP Board Installation* later in this chapter.

- 8. Configure EPSON RC+. Refer to the section 2.10 EPSON RC+ Fieldbus I/O Installation later in this chapter.
- 9. Operate the PROFIBUS DP network.

2.4 PROFIBUS DP Network Construction

Network Configuration

A PROFIBUS DP network is configured as shown in the following figure.



Station

There are four types of stations (devices): master, slave, repeater, and configurator.

The master controls a network and gathers its slaves.

The slave, including external I/O and other devices, outputs data as a response to a master's output order and informs the master of its input status.

The repeater is necessary for a network with more than 32 slaves to separate network segments.

The configurator, used only for network installation, configures a scan list of the slaves on the master device.

You can install masters anywhere on the network. You can connect up to 126 stations including server and repeater on your network. However, we recommend you to use one device for the engineering device.

Network Cable

The PROFIBUS cable can be used as a network cable. There are four types (A, B, C, D) of PROFIBUS cables. Normally, cable type A is used for a PROFIBUS DP network. The cable type A specifications are shown in the table below.

Item	Specification
Impedance	135 to 165 Ω
Capacity	< 30 pf/m
Loop resistance	110 Ω/km
Wire diameter	0.64 mm
Core cross-section	$> 0.34 \text{ mm}^2$

It is recommended that a 9-pin D-Sub connector be used for protecting rating IP 20. For IP 65/67, M12 connector in accordance with IEC 947-5-2, Han-Bird connector in accordance with DESINA, and Siemens hybrid connector are available.

Pin No.	Signal	Assignment
1	Shield	Shield / Protective ground
2	M24	Ground of output voltage (24 V)
3	RxD/TxD-P	Data line B
4	CNTR-P	Repeater control signal (directional control)
5	DGND	Communications power supply (5 V)
6	VP	Supply voltage to terminating resistor (P5V)
7	P24	Output voltage (24 V)
8	RxD/TxD-N	Data line A
9	CNTR-N	Repeater control signal (directional control)

Pin assignment (9-pin D-Sub)

Use pins 2 and 7 for connecting a maintenance device without any power supply.

The following figure illustrates wiring.



Different manufacturers produce a wide range of PROFIBUS cables. For details of the PROFIBUS cables, see PROFIBUS International's website (http://www.profibus.com/).

Terminating Resistor

To reduce reflections of communication signal, terminating resistors should be attached on both ends of each segment. Attach the terminating resistor as shown below.



Some PROFIBUS 9-pin D-Sub connectors on the market have functions of terminating resistor and they can enable / disable the terminating resistor. (Example: Woodhead MA9D00-32)

Molded terminating resistors with connector are also available to attach them to environment-resistant M12 connector.

Baud Rate and Maximum Cable Length

Available baud rates are 9.6 kbps, 19.2 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1500 kbps, 3 Mbps, 6 Mbps, and 12 Mbps.

PROFIBUS DP requires approximately 1ms at 12 Mbps for the transmission of 512 bits input data and 512 bits output data distributed over 32 stations. The following figure shows typical PROFIBUS DP transmission times depending on the number of stations and baud rate.



The maximum cable length is restricted by the baud rate.

Baud Rate	Maximum Cable Length
12 Mbps	100 m
6 Mbps	100 m
3 Mbps	100 m
1500 kbps	200 m
500 kbps	400 m
187.5 kbps	1000 m
93.75 kbps	1200 m
19.2 kbps	1200 m
9.6 kbps	1200 m

Multi-Master Configuration

PROFIBUS DP allows you to install multiple masters on a single physical network.

All slave devices on the network can be accessed by different masters. Only one master on the network can be used for device configuration.

The following figure illustrates the communication procedure for a multi-master configuration.



When the master receives the logic token, it inquires data from its slaves. After all communications are completed, the master passes the token to another master. In this way, the master can only communicate with its slaves while it is holding the token. The slaves respond to only the inquiry from the master. No slave can output any messages.

Procedure for Modifying and Installing Communication Cables

The following procedure explains how to modify and install a Woodhead 9-pin D-Sub connector (MA9D00-32).

Follow the steps described below to modify communication cables and connect them to the connector.

 Be careful not to injure your hands or fingers on any sharp blades or tools used to modify the cable. Use appropriate blades and/or other tools to modify the cable. Using inappropriate blades and/or other tools may result in bodily injury and/or equipment damage.
(1) Strip approx. 47.5 mm of the cable covering with extra care so that you do not scratch on braided shield underneath. Do not strip the cable covering more than necessary. Excess stripping may cause short-circuit and/or make

> (2) Carefully expand meshes of the braided shield and fold back the shield over the cable covering. Cut off the shield at approx. 10 mm from the stripped side of the cable covering.

the cable more sensitive to noise.



40 mm 7.5 mm

- (3) Strip the covering of the signal wire as shown in the figure.
- (4) Insert the signal wires into the terminal block on the connector and secure the signal wires. Carefully connect the same signal wire to the same terminal on both ends. To prevent faulty wiring, make a rule of connection. For instance, connect the green signal wire to the A1/A2 terminal and the red signal wire to the B1/B2 terminal.

2.5 How to Setup a EtherNet/IP Network

The following is a basic procedure for setting up a EtherNet/IP network:

- 1. Choose node distribution and distribution route on your network. For details, refer to the following section 2.6 *EtherNet/IP Network Construction*.
- 2. Lay cables. For details, refer to the following section 2.6 *EtherNet/IP Network Construction*.
- Configure nodes. For details, refer to respective manuals of your desired nodes.
- 4. Turn ON the nodes.
- Install the scanner board in your controller. Refer to the section 2.9 EtherNet/IP Board Installation later in this chapter.
- 6. Configure a master and slaves. Use the configuration management software for configuring a master and slaves (scan list). For details, please refer to the configuration management software manual. To configure EPSON RC+ as a master, refer to the section 2.9 EtherNet/IP Board Installation later in this chapter.
- 7. Configure EPSON RC+. Refer to the section 2.10 EPSON RC+ Fieldbus I/O Installation later in this chapter.
- 8. Operate the EtherNet/IP network.
2.6 EtherNet/IP Network Construction

Network Configuration

A EtherNet/IP network is configured as shown in the following figure.



Node

There are two types of the node: master and slave. The master controls a network and gathers data from its slaves. The slaves, including external I/O and other devices, output data in response to the master's output order and informs the master of its input status.

You can install masters anywhere in the network. One master node can control up to 127 nodes.

Universal Ethernet cable is used for EtherNet/IP. Use a proper cable such as environmental resistance and refraction resistance that fulfills the environment. For details, see the website of ODVA. (http://www.odva.org/)

Wiring

Wirings are conformed to EtherNet/IP connection protocol.



You can use the generic Ethernet hub or Ethernet switch for the EtherNet/IP. However, be sure to a use product complying with the industrial standards or noise resistant Ethernet cable (STP cable). If you use an office use product or UTP cable, it may causes communication errors and may not offer the proper performance.

2.7 DeviceNet Board Installation

Following two types can be used for the fieldbus I/O option DeviceNet.

- PCU-DVNIO

- PCI-DVNIO

2.7.1 Board Appearance

Part names and functions of the scanner board are shown in the following figure. For details of the status display LEDs (Module/NetWork LED and IO LED), refer to the *4*. *Troubleshooting* in this manual.

PCU-DVNIO



Part Number	applicom PCI-DVNIO / PCU-DVNIO
Modes	Master/Slave
Baud rates	125, 250, 500 kbps
Interface	1 DeviceNet port
Supported Devices	Group 2 Only Server and U.C.M.M. capable
Maximum Nodes	63
Connection Types	Strobe, Polling, Cyclic and Change of State
Explicit Messaging	Yes
EDS Support	Yes
Input Data Size	1 to 255 bytes
Output Data Size	1 to 255 bytes
Automatic Detection	Yes. Devices can be detected automatically.

2.7.2 Specifications

2.7.3 Software Installation

Before installing any boards in your controller, you must install the applicomIO console application and drivers for the type of board you will be using.

- (1) Start the controller.
- (2) Run the C:\Install\FieldBus\Install\applicomIO\Disk1\Setup.EXE from the install folder in the controller to start the installation.
- (3) Select the desired language for the installer.
- (4) Select Install Products.
- (5) Select applicomIO. Do not select applicomIO ActiveX.



(6) Allow the default components to be installed.

Select Components		
Choose the components Set	tup will install.	
Select the components you want to install.	u want to install, clear the components y	ou do not
DDE server	0 K 🔤 SuiteLink,FastDDE	0 K
OPC server	0 K	
v Help files	0 К	
Description "DDE" server installati DDE mode.	on giving access to applicomIOm interfac	ces in
Space Required C:	70140 K	
Space Available C:	3411844 K	
applicom	<u> < B</u> ack <u>N</u> ext >	Cancel

(7) Select the protocol: DeviceNet you will be using. If you also use PROFIBUS DP, select Profibus-DP as well. Select which type of device data files to install (EDS for DeviceNet, GSD for PROFIBUS DP).

applicomIO 2.3		×
Select protocols		
Select the protocols w requires IMPERATIVELY	ith the scroll-bar . The installation the right license.	n of a protocol
🔽 DeviceNet	15565 K 🔺 🔽 DeviceNet Protoco	ol 138 K 🔺
🗆 InterBus-S	0 K 🔤 EDS Allen-Bradley	. 7893 К 🖵
Profibus-DP	1182 K 🛛 🖵 EDS Banner Engine	e 132 K
⊋ Ethernet	17040 K	•. 421 K
Description DeviceNet protocol c managed by O.D.V.A ((ommunication is based on CAN fieldbus Open DeviceNet Vendor Association).	and is
Space Required C:	107496 K	
Space Available C:	3411324 K	
applicom	< Back Next >	Cancel

- (8) Complete the installation.
- (9) The message to ensure the restart appears. Click the Yes button.
- (10)Start the C:\Install\FieldBus\Install\SP\Setup.EXE and install the service pack. No installation is necessary when a service pack is not attached to controller.
- (11)After completing the installation of the service pack, shutdown the computer.
- (12) Proceed to 2.5.4 Board Installation.

2.7.4 Board Installation

WARNING

Make sure that the power is turned OFF before installing/removing any boards or connecting/disconnecting any cables. Installing/removing any boards or connecting/disconnecting any cables with the power ON is extremely hazardous and may result in electric shock and/or malfunction of equipment.

(1) Configure the board address jumper (JP1) on each board. The board number must start with 1 consecutively. Refer to the following table for JP1 configuration.

Short Socket Board No.	C0	C1	C2
1	0: Short	0: Short	0: Short
2	1: Short	0: Short	0: Short
3	0: Short	1: Short	0: Short
4	1: Short	1: Short	0: Short
5	0: Short	0: Short	1: Short
6	1: Short	0: Short	1: Short
7	0: Short	1: Short	1: Short
8	1: Short	1: Short	1: Short

- (2) Install the board(s) in any available PCI slot in the controller.
- (3) Connect the board(s) to the Fieldbus.
- (4) Start the controller.
- (5) The Windows Hardware Wizard will display a message that the applicomIO board was found and prompt you to restart the computer. The applicomIO console application will automatically start for this first start after installation. Close this application for now and restart the controller.
- (6) Start the applicomIO console application.
- (7) Click the **Add Board** button on the upper left of the console window to add a board.



(8) The following dialog will appear.

	0	<u> </u>	11								
Add New Board											? ×
Board 1: Board to Add Board Type : Description : PC104/ISA Boa DPRAM Base A	PC 1 Devic rd Paramet iddress : 1 Manual Ci	FDVNIO eNet channel ers D4000		mations — A PCI-DV Press Ok	'NIO board co to add this o	orrectly d	letected. Ir configurat	ion.			
							ок	1	<u>C</u> ancel	1	Help

Check that "PCI-DVNIO" ("PCI-DPIO" or "PCU-DPIO" in case of PROFIBUS DP)

is shown in the Board Type: box. Then, click the OK button.

When installing more than two fieldbus boards in the system, add all the boards using this dialog.

The following dialog will appear when no board is detected. Ensure that the board is correctly inserted and that the board configuration is correct.

Add New Board	<u>? ×</u>
Board 2 Board to Add Board Type : ABSENT Description : PC104/ISA Board Parameters DPRAM Base Address : D4000 y Diagnostic and Manual Configuration >>	Informations No board 2 was detected. Press the "Diagnostic and Manual Configuration" button to have more information or to manually configure this one.
	OK Qancel Help

- (9) After all the boards are added, the system should be restarted.
 - Close the applicomIO Console application and click the **OK** button on the **Save modification** dialog. Click the **OK** button on the following dialog to restart Windows.

11 mao	
applicomIO	R Console X
•	You have to restart the PC in order to your new configuration takes effect on the applicomJO ₄ driver.
	OK I

(10)After restarting the system, continue with the following 2.5.5 Master Mode or 2.5.6 Slave Mode sections.

2.7.5 Master Mode

- (1) Ensure that the board is connected to the fieldbus. Then, start the applicomIO console application.
- (2) Register the device information (EDS file) that is necessary for the network setup. Select the [Equipment Library] tab at the center of the dialog's right side and click the **Add** icon.



(3) Following dialog appears. Specify the EDS file that is supplied from the device manufacturer.

Select configuration t	files	? ×
ファイルの場所型:	🔁 Equipment Library 💽 🖛 🗈 📸	
DeviceNet_eds ETHERNET_IP_ EthernetIPxml Multi_Messagin Profibus Profibus_gsd	_ Profibus_Slave EDS ε_Ethernet	
ファイル名(<u>N</u>):	開(@)	
ファイルの種類(工):	DeviceNet Electronic Data Sheet (*EDS) ・ キャンセノ	<u>اً</u>

(4) Click on the "Protocol list" under the board that was just added.



(5) Select Protocol | Property.

(6) Configure the baud rate, MAC ID (master address), and so on for the DeviceNet network.

General Configuration 1/O Summary	1
Baud Rate : 500 Kbits/s	
MAC ID : 000	
Interscan Delay (2 - 9000) : 2 ms Default Values	
Foreground to Background Poll Ratio (1 – 32000) :	
Halp OK Garcel	

NOTE

The load on a bus can be controlled by the baud rate and interscan delay settings. When the load exceeds 60%, the DeviceNet network communication will be unstable, for example: more communication errors. Set the configuration to minimize the load.

For the procedure for verifying the load on the bus using the applicomIO Console application, refer to the *4. Troubleshooting* in this manual.

(7) Click the Network Detection tab on the center left of the console window.



(8) Click the **Read Network Configuration** button to display the **Network Detection** dialog and read in the devices on the Fieldbus.

Vetwork Detection	
2 devices detected	
Qancel	16%

(9) Drag each device you want to scan from the **Network Detection** tab to the Master item in the list on the right.



(10) The following dialog will appear.

[003] - 8 Output		? ×
General Configuration EDS Information Connection Configuration Identification Equipment : 003 _	Check Identification	
MAC ID : 1003 V Link V Active	I Product Type I Product Code I Revision	
Description	*	
<u></u>	<u>Q</u> K <u>C</u> ancel	

Select the **Connection Configuration** tab to verify the connection configuration. Change the configuration if necessary.

[003] - 8 Output	<u>? ×</u>
General Configuration EDS Information Connection Cor	nfiguration
□ 🔽 Polling	Change O <u>f</u> State
Input Size (0 - 255) : 2 📑 Bytes	Input Size (0 - 255) : 🛛 📃 Bytes
Output Size (0 - 255) : 1 📑 Bytes	Output Size (0 - 255) : 📋 📃 Bytes
Poll Rate : Every scan 💌	Heartbeat Rate (48 - 30000) : 250 📰 ms
└ Stro <u>b</u> e	
Input Size (0 - 8) : 📋 📃 Bytes	Input Size (0 - 255) : 🛛 🚊 Bytes
	Output Size (0 - 255) : 🧻 📃 Bytes
EDS <u>D</u> efault Values	Send Rate (48 - 30000) : 1000 🚍 ms
<u>V</u> alues from Device	
Name : Output 1 Description :	<u>^</u>
	Help

NOTE

Not every slave device supports all connection types. Understand the specifications of the slave device you want to use and configure the connection correctly.

[003] - 8 Output	<u>?</u> ×
General Configuration EDS Information Connection Configuration [FV Polline] Input Size (0 - 255) : Output Size (0 - 255) : Poll Rate : Every scan	ration Explicit Message EDS Viewer Change Of State Input Size (0 - 255) : 2 Bytes Output Size (0 - 255) : 1 Bytes Heartbeat Rate (48 - 30000) : 250 mmmm ms
EDS Default Values	Cyclic Input Size (0 - 255) : 2 _ Bytes Output Size (0 - 255) : 1 _ Bytes Send Rate (48 - 30000) : 1000 _ ms
Values from Device	Help OK Cancel

The **Expert Mode** button will appear when the applicomIO Console application is used in the expert mode.

To configure details of "Change Of State" and "Cyclic", click the **Expert Mode** button and display the **Expert Mode** dialog.

Ехр	ert Mode				? ×
ſ	hange Of State / Cyclic				
	Change Of State				
	Inhibit Timer (0 - 32000)	1	ms	<u>D</u> efault Values	
				J	
	- I Ack Time Out (0 - 10000)	16	ms		
		<u>H</u> elp		<u>OK</u> ance	el

NOTE

Never disable Ack. When the [Ack] checkbox is unchecked, a failed connection is not regarded as an error.

(11)When the system cannot identify the device you want to use (its EDS file is not registered), the following dialog will appear. In this case, obtain the EDS file from the device manufacturer and register it. Then, start from step 5 (Network Detection) of this procedure.

MA	iC ID: 2 -	- TDN-	8C0-108	? ×
ſ	Files Cho	oice		
	?	No EI EDS 1	DS file matches to the device! Do you want to create a ille ?	n
	Device	Name	File Name	
				- 1
			<u>C</u> reate New EDS File	
-				
			Help <u>OK</u>	cel

To create a new EDS file based on the data from the device, click the **Create New EDS File** button.

Create EDS		? ×
Files Choice		
Center a	name and a description for the EDS file	
File name :	0010000000020103.eds	
File description :	TDN-8C0-108	
	<u>H</u> elp <u>O</u> K	<u>C</u> ancel

When a new EDS file is created, the following dialog will appear to verify the contents of the file.

TDN-8C0-108	<u> </u>
Device Information EDS Information Connection Configuration	
	▲
MAC ID : 2	
Vendor ID : 16 - Daniel Woodhead Co.	
Product Type : 0 - Generic Device	
Product Code: 2 - TDN-8C0-108	
📲 🚽 🦿 🦞 Serial Number : 4472	
📕 🦳 🦵 🖁 Revision : 1.3	
📲 🔤 🚰 🕺 Status : 0 –	
🖻 🖻 Connection supported	
Input Size in Byte : 3	
Contract Size in Byte : 0	
🚽 🚽 🖓 Consumed Connection Path	
Produced Connection Path: 20 04 24 01 30 03	_
📄 🖨 🔂 C.O.S.	
🗌 🚽 💡 Output Size in Byte : 0	
🔜 🚽 🖓 Consumed Connection Path	-
Kext >> Help OK Cancel	el.

(12)Select the **Equipment Library** tab on the center left of the console window and click the **Add** button to register the new EDS file in the system.



(13)Select File | Download in Flash to register the configuration in the fieldbus board.



After a few seconds, the board's state will show green in the status bar.



(14)Now, the fieldbus board is ready to operate as a master. Close the applicomIO Console application.

2.7.6 Slave Mode

- (1) Ensure that the board is connected to the fieldbus. Then, start the applicomIO console application.
- (2) Click on the "Protocol list" under the board that was just added.

applicomIOR console			
<u>F</u> ile <u>D</u> escription <u>L</u> ibrary <u>N</u> etwork	<u>P</u> rotocol <u>T</u> ools <u>I</u> tems	2	
	Dyplicate Ctrl+D Delete Del		
	Properties Space	DeviceNet Master : MAC ID: 00 - Baud Rate: 125 Kbits/s III [None] DeviceNet Local Slave	
<u></u>	Diagnostic		
🖃 🚏 Description (CONFIG01)	Option		
Boards configuration			
Protocol (DeviceNet)	: DeviceNet, Max		
DDE server parameters			
OPC server parameters			

- (3) Select Protocol | Properties.
- (4) Configure the baud rate, MAC ID (slave address), and so on for the DeviceNet network. In this example, the MAC ID (slave address) is set to 005.

DeviceNet Master			? ×
General Configuration I/O Summ	ary		(
Baud Rate :	500 Kbits/s 💌		
MAC ID :	005		
Interscan Delay (2 - 9000) :	2	ms	Default Values
Foreground to Background Poll Ratio (1- 32000) :	1		
	Halp 1		Canad
	Пенр	QK	

NOTE	
Ś	

Specify an unused address on the network for a slave device as well as other devices.

(5) Double-click the "DeviceNet Local Slave" item.



(6) The DeviceNet Local Slave property sheet will appear. Select the Equipment (device) ID. It must be the same number as the Master ID in step (4).

[None] - DeviceNet Local Slave	? ×
General Configuration Connection Configuration EDS View	ver
Identification	
Equipment : 005 💌	Active
- Description	
	<u> </u>
	T
<u>H</u> elp	<u>O</u> K <u>C</u> ancel

(7) Click on the Connection Configuration tab. Check the Polling check box and configure how many inputs and outputs for the slave device. In this example, the Output Size and Input Size are set to 8 bytes.

[UU5] - DeviceNet Local Slave	<u>? ×</u>
General Configuration Connection Configuration	n EDS Viewer
Output Size (0 - 8) : D Bytes	C COS. C Cyclic
Polling	Output Size (0 - 255) : 0 Bytes
Output Size (0 - 255) : 8 Bytes	
Input Size (0 - 255) : 8 Bytes	Input Size (0 - 255) : 🛛 Bytes
	Help OK Cancel



The load on a bus varies depending on the input/output size settings.

When the load exceeds 60%, the DeviceNet network communications will be unstable, for example: more communication errors. Restrict the input/output sizes to the minimum necessary to minimize the load. The load is also controlled by baud rate in the master configuration.

For the procedure for verifying the load on the bus using the applicomIO Console application, refer to the *4. Troubleshooting* in this manual.

The input/output sizes of each node may be restricted depending on the master.

For details of the permitted data size, refer to the respective manuals of the masters.

(8) Click OK.

(9) Select File | Download in Flash to register the configuration in the fieldbus board.



a applicom/OR console	- O ×
Eile Description Library Network Protocol Tools Items ?	
Communications Adapter Communications Adapter Contractor Contrac	
Saving configuration files Saving configuration files complete	
Dutruit Massace View	
Lontigured boards state:	

- (10)Close the applicomIO console application.
- (11)The default slave EDS file is created.

The path is: C:\Program Files\Woodhead\Direct-link\ApplicomIO2.3\ConfigIO \Config01\applicomio.eds.

You may make a copy of the default slave EDS file and modify it to create your original EDS file if necessary.

Edit the copy of the slave EDS file using Notepad. You may want to change the VendName and ProductTypeStr.

```
\ EDS File Generated by applicomIO® Console Version : 2.2
[File]
                 = "EDS for applicomIO Scanner";
      DescText
      CreateDate = 02-01-2004;
CreateTime = 08:14:41;
     ModDate
                   = 02-01-2004;
      ModTime
                   = 08:14:41;
     Revision
                   = 1.0;
[Device]
                   = 579;
     VendCode
     VendCode= 579ProdType= 12;ProdCode= 1;
     MajRev
                   = 1;
     MinRev = 2;
VendName = "applicom international";
      ProdTypeStr = "Communication Adapter";
      ProdName = "applicomIO Scanner";
      Catalog
                  = "";
[IO Info]
     Default
                   = 0 \times 0000;
```

Copy the EDS file to the system where the master is located. Add the new slave device to the master using the new EDS file.

(12)On the master system, scan the network for new devices. The new slave device should be detected.

Use the EDS file created in previous steps for the slave device.

2.8 PROFIBUS DP Board Installation

Following two board types can be used for the fieldbus I/O option PROFIBUS DP.

- PCU-DPIO
- PCI-DPIO

2.8.1 Board Appearance

Part names and functions of the scanner board are shown in the following figure. For details of the status display LEDs, refer to the *4. Troubleshooting* in this manual.

PCU-DPIO



Part Number	applicom PCI-DPIO / PCU-DPIO
Modes	Master/Slave
Baud Rates	9.6, 19.2, 93.75, 187.5, 500, 1500, 3000, 6000, 12000 kbps
Interface	1 PROFIBUS port (EN 50 170)
Output Current Capacity	Maximum 150mA
Supported Devices	All DP Devices
Maximum Stations	126 (32 per segment)
GDS Support	Yes
PROFIBUS DP Class 1	Yes
PROFIBUS DP Class 2	Yes
Input Data Size	1 to 244 bytes
Output Data Size	1 to 244 bytes
Automatic Detection	Yes. Devices can be detected automatically.

2.8.2 Specifications

2.8.3 Software Installation

Before installing any boards in your controller, you must install the applicomIO console application and drivers for the type of board you will be using.

- (1) Start the controller.
- (2) Run the C:\Install\FieldBus\Install\applicomIO\Disk1\Setup.EXE from the install folder in the controller to start the installation.
- (3) Select the desired language for the installer.
- (4) Select Install Products.
- (5) Select applicomIO. Do not select applicomIO ActiveX.

Inst	Laster in Industrial Communication and Connectivity
	Applicantol [®] Windows N14 SP6, Windows 2000 SP4, Windows XP SP 2 Windows 2000 SP4, Windows XP SP 2 For the other variable platforms (VP Embedded, VesturCom RTX, V:Works, ONK, Linux,
	Dos), please contact Woodhead Sottware & Electronic's sales offices.
	applicom [®] ActiveX control for Windows NT4 SP6, Windows 2000 SP3, Windows XP SP 1 and Windows 2003 server
	This product provides connectivity to any ActiveX container applications which need to access OPC servers installed on local or remote PCs. To enable the ActiveX control, you necessary have to define a connection to the applicam® OPC server.
EXIT	applicom , SST and Direct-Link are trademarks of Woodhead Industries; Inc. Copyright © 2005 Woodhead Software & Electronics. All rights reserved.

(6) Allow the default components to be installed.



(7) Select the protocol: PROFIBUS DP you will be using. If you also use DeviceNet, select DeviceNet as well. Select which type of device data files to install (GSD for PROFIBUS DP, EDS for DeviceNet).

pplicomIO 2.3	
Select protocols	
Select the protocols w requires IMPERATIVELY (th the scroll-bar . The installation of a protocol he right license.
✓ DeviceNet	15565 K 🔺 🔽 Profibus DP protocol 🛛 1182 K
InterBus-S	0 K
Profibus-DP	1182 K
⊋ Ethernet	17040 K
Description EN 50170 standard pro Slave).	ocol for communication Profibus DP (Master and/or
Space Required C:	107496 K
Space Available C:	3410804 K
applicom	< <u>B</u> ack <u>N</u> ext > Cancel

- (8) Complete the installation.
- (9) The message to ensure the restart appears. Click the Yes button.
- (10)Start the C:\Install\FieldBus\Install\SP\Setup.EXE and install the service pack. No installation is necessary when a service pack is not attached to controller.
- (11)After completing the installation of the service pack, shutdown the computer.

(12) Proceed to 2.6.4 Board Installation.

2.8.4 Board Installation



Make sure that the power is turned OFF before installing/removing any boards or connecting/disconnecting any cables. Installing/removing any boards or connecting/disconnecting any cables with the power ON is extremely hazardous and may result in electric shock and/or malfunction of equipment.

(1) Configure the board address jumper (JP1) on each board. The board number must start with 1 consecutively. Refer to the following table for JP1 configuration.

Short Socket Board No.	C0	C1	C2
1	0: Short	0: Short	0: Short
2	1: Short	0: Short	0: Short
3	0: Short	1: Short	0: Short
4	1: Short	1: Short	0: Short
5	0: Short	0: Short	1: Short
6	1: Short	0: Short	1: Short
7	0: Short	1: Short	1: Short
8	1: Short	1: Short	1: Short

- (2) Install the board(s) in any available PCI slot in the controller.
- (3) Connect the board(s) to the Fieldbus.
- (4) Start the controller.
- (5) The Windows Hardware Wizard will display a message that the applicomIO board was found and prompt you to restart the computer. The applicomIO console application will automatically start for this first start after installation. Close this application for now and restart the controller.
- (6) Start the applicomIO console application.
- (7) Click the Add Board button on the upper left of the console window to add a board.



(8) The following dialog will appear.

Add New Board		<u>?</u> ×
Board 1: Board 1: Board to Add Board Type : PCI-DPIO Description : 1 Profibus channel 12 Mb PC104/ISA Board Parameters DPRAM Base Address : 04000 y	Informations A PCI-DPIO board correctly detected. Press Ok to add this one in your configuration.	
	OK <u>C</u> ancel <u>H</u> el	р

Check that "PCI-DPIO" or "PCU-DPIO" ("PCI-DVNIO" in case of DeviceNet) is shown in the **Board Type:** box. Then, click the **OK** button. When installing more than two fieldbus boards in the system, add all the boards using this dialog.

The following dialog will appear when no board is detected. Ensure that the board is correctly inserted and that the board configuration is correct.

Add New Board		<u>?</u> ×
Board 2 Board to Add Board Type : ABSENT Description : PC104/ISA Board Parameters DPRAM Base Address : D4000 y Diagnostic and Manual Configuration >>	Informations No board 2 was detected. Press the "Diagnostic and Manual Configuration" button to have more information or to manually configure this one.	
	OK <u>C</u> ancel <u>H</u> el	p

(9) After all the boards are added, the system should be restarted.

Close the applicomIO Console application and click the **OK** button on the **Save modification** dialog. Click the **OK** button on the following dialog to restart Windows.

applicomIO	R Console
i	You have to restart the PC in order to your new configuration takes effect on the applicomIO ₄ driver.
	CK I

(10)After restarting the system, continue with the following 2.6.5 Master Mode or 2.6.6 Slave Mode sections.

2.8.5 Master Mode

- (1) Ensure that the board is connected to the fieldbus. Then, start the applicomIO console application.
- (2) Register the device information (GSD file) that is necessary for the network setup. Select the [Equipment Library] tab at the center of the dialog's right side and click the **Add** icon.



(3) Following dialog appears. Specify the GSD file that is supplied from the device manufacturer.

Select configuration f	iles			1	? ×
ファイルの場所(型:	🔁 Equipment Library	•	(÷	💣 🎟 •	
DeviceNet_eds ETHERNET_IP_ EthernetIPxml Multi_Messagin Profibus Profibus_gsd	Profibus_Slave EDS g_Ethernet				
ファイル名(<u>N</u>):	*.gsd			開((0))	
ファイルの種類(工):	PROFIBUS (*.gs?)		-	キャンセル	

(4) Select **Description** | **Properties**.



(5) Select the "Profibus, Master/Slave" in the **Channel Properties** dialog and click the **OK** button.

hannel Properties		x
Available Protocols		
Protocol	Manufacturer	
None	None	
Profibus, Master/Slav	e EN 50170	
Protibus, Slave	EN OUT/U	
,		
Profibus-DP		
	OK Cancel	

(6) Click on the "Protocol list" under the board that was just added.

applicomIOR console		
<u>File Description Library N</u> etwo	rk <u>Protocol T</u> ools Items <u>?</u>	
	Duplicate Ctrl+D Delete Del	
	PROFIBUS Master - Station: 000 - 9.6 kbit/s	
	Properties Space 19 [None] Local DP Slave	
	Diagn <u>o</u> stic	
🖃 📅 Description (CONFIG01)	Option	
🖻 🖳 Boards configuration		
🖻 💵 Board 1: PCI-DPIC		
🚽 🖓 Protocol (Profibu	s): Profibus, Master/	
DDE server parameters		
OPC server parameters		

- (7) Select Protocol | Properties.
- (8) Configure the baud rate, Master Profibus Address (master address), number of repeaters, and so on for the PROFIBUS DP network.



- I × applic: omIOR con File Description Library Network Protocol Tools Items ? 🚽 🗏 📓 🙎 🗖 🗖 🔍 🔜 🔜 🗉 🚏 Description (CONFIG01) Boards configuration
 Boards configuration
 Boards 1: PCI-DPIO
 Dord 1: PCI-DPIO
 DDE server parameters
 OPC server parameters ► 🙀) 🗟 🌩 🛸 🚱 Read Network Configuration 🔄 Equipment Library 🔞 Network Detection Loading configuration files... WARNING : No configuration files found • Loading configuration files complete 🛄 Output Message View lol(II Iol(IÌI\\|/IñI\\|IðIØIè'Ö||IÜ|·IB Configured boards state : 1
- (9) Click the **Network Detection** tab on the center left of the console window.

(10)Click the **Read Network Configuration** button to display the **Network Detection** dialog and read in the devices on the fieldbus.



(11)Drag each device you want to scan from the **Network Detection** tab to the Master item in the list on the right.



(12) The following dialog will appear.

The device name is shown on the dialog title bar. Click the **OK** button.

àeneral Configuration	GSD Information	Parameters Modules Confi	guration	
Identification				
Equipment :	002 🔻	I link	🖂 Antina	
Station :	002 💌	I. Eurix	j♥ A <u>c</u> tive	
- Parameters				
Watchdog Contro	l (0-255) :	50 × 100 ms		
Data Format :		Big Endian (Motorola)	•	
Description				
				1
			T	J
				_

When the system cannot identify the device you want to use (its GSD file is not registered), the following dialog will appear. In this case, obtain the GSD file from the device manufacturer and register it. Then, start from step 5 (Network Detection) of this procedure.

Station :2 Id :0x061A			? ×
Files Choice			
No descrip Select gen	tion file can be associated eric file to use the device.	with the equipment	!
Device Name File	Name		
Generic Device gene	ric device		
· · · · · · · · · · · · · · · · · · ·			
	<u>H</u> elp	<u>0</u> K	<u>C</u> ancel
applicomIOB console			
appliconizor (console			
A module (value : 00 11) Please check in folder "I	detected on station :2 has Module Configuration" the '	no entry in its GSI Undetermined Mod	D file. ule″
	OK		

(13)Select the **Equipment Library** tab on the center left of the console window and click the **Add** button to register the new GSD file in the system.



(14)Select File | Download in Flash to register the configuration in the fieldbus board.



After a few seconds, the board's state will show green in the status bar.

applicomIOR console	
<u>File Description Library Network Protocol Tools</u>	Items ?
	0 PROFIBUS Master - Station: 000 - 12 Mbit/s - 2 [002] Station: 002 TPD-8C0-B18-02 - 2 [003] Station: 003 TPD-80C-B18-02
Pescription (CONFIG01) Pescription (CON	—백의 [None] Local DP Slave
Image: Weight of the section	
Equipment Library 👷 Network Detection	
Saving configuration files Saving configuration files complete	1 1
Dutput Message View	\frown
Ready	Configured boards state :

Now, the fieldbus board is ready to operate as a master. Close the applicomIO Console application.

2.8.6 Slave Mode

- (1) Ensure that the board is connected to the fieldbus. Then, start the applicomIO console application.
- (2) Select Description | Properties.



(3) Select the "Profibus, Slave" in the **Cannel Properties** dialog and click the **OK** button.

Cha	nnel Properties		×
ſ	Protocol	Manufacturer	
	None Profibus, Master/Slave Profibus, Slave	None e EN 50170 EN 50170	
) Profibus-DP Passive S	lave	—1
		OK Cancel	



Though you can select the "Profibus, Master/Slave" as a slave, it might not communicate properly in some Master. To use only the slave function, select the "Profibus, Slave".

(4) Click on the "Protocol list" under the board that was just added.



(5) Select Protocol | Properties.

(6) Configure the baud rate, Master Profibus Address (slave address), number of repeaters, and so on for the PROFIBUS DP network. In this example, the Master Profibus Address (slave address) is set to 005.

Profibus Master	<u>? ×</u>
General Configuration Advanced Configuration	
Baud Rate :	12 Mbit/s 💌
Master Profibus Address (0-126):	005
Highest Station Address (HSA:2-126) :	126 💌
Number of Repeaters (0-3):	0 💌
<u>H</u> elp	<u>QK</u> <u>C</u> ancel

NOTE (P

Specify an unused address on the network for a slave device as well as other devices.

(7) Double-click the "Local DP Slave" item.



(8) The Local DP Slave property sheet will appear. Select the Equipment (device) ID. It must be the same number as the Master Profibus Address in step (4). In this manual, the input/output sizes are set to 8 bytes.

<u> </u>	_
⊠ <u>A</u> ctive	
▼ Bytes	
▼ Bytes	
an (Motorola) 📃 💌	
-	
<u> </u>	
Help <u>Ö</u> K <u>C</u> ancel	
indi	✓ Active ✓ Bytes ✓ Bytes indian (Motorola) ✓ ✓ HelpKCancel



The input/output sizes of each station may be restricted depending on the master. For details of the permitted data size, refer to the respective manuals of the masters. (9) Select File | Download in Flash to register the configuration in the fieldbus board.



After a few seconds, the board's state will show green in the status bar.



(10)Now the fieldbus board is ready to operate as a slave. Close the application.

2.8.7 GSD File

A GSD file is a device data file for registering slave configuration data in the configurator (device or software that configures the master).

The standard GSD file for EPSON robot controller RC520 and RC420 is provided in the following path:

c:\Program Files\Woodhead\Direct-Link\applicomIO2.3\Equipment Library \Profibus_gsd\app0890.gsd.

For details of the PROFIBUS DP network configuration, contact the manufacturer of the master device you use. If you use EPSON RC+ as a master device, you do not need to register EPSON RC+ since the said GSD file was installed.

2.9 EtherNet/IP Board Installation

Following two board types can be used for the fieldbus I/O option EtherNet/IP.

- PCU-ETHIO

2.9.1 Board Appearance

Part names and functions of the scanner board are shown in the following figure. For details of the status display LEDs, refer to the *4. Troubleshooting* in this manual.

PCU-ETHIO



2.9.2 Specifications

Part Number	applicom PCU-ETHIO
Modes	Master/Slave
Baud Rates	10, 100 Mbps
Interface	EtherNet/IP 1 port
Maximum Node	127
Connection Type	Cyclic, Change of State
Explicit messaging	Yes
EDS support	Yes
Input Data Size	1 to 505 bytes
Output Data Size	1 to 509 bytes
Automatic Detection	Yes. Devices can be detected automatically.

2.9.3 Software Installation

Before installing any boards in your controller, you must install the applicomIO console application and drivers for the type of board you will be using.

- (1) Start the controller.
- (2) Run the C:\Install\FieldBus\Install\applicomIO\Disk1\Setup.EXE from the install folder in the controller to start the installation.
- (3) Select the desired language for the installer.
- (4) Select Install Products.
- (5) Select applicomIO. Do not select applicomIO ActiveX.



(6) Allow the default components to be installed.

applicomIO 2.3	<u>×</u>
Select Components Choose the components Setup will	install.
Select the components you want to want to install.	o install, clear the components you do not
DDE server	0 K SuiteLink,FastDDE 0 K
OPC server	0 K
₩Help files	ОК
Description "DDE" server installation givin	≰ access to applicomIO∍ interfaces in
DDE mode.	
Space Required C:	70140 K
Space Available C:	3411844 K
applicomIO	<u>≤Back</u> Next > Cancel

(7) Select the protocol: Ethernet you will be using.

If you also use DeviceNet, select DeviceNet as well. If you also use PROFIBUS DP, select Profibus-DP as well.

Select which type of device data files to install (GSD for PROFIBUS DP, EDS for DeviceNet).

elect protocols			27
Select the protocols w requires IMPERATIVELY H	ith the scroll- the right licer	bar . The installation of a se.	a protocol
✓ DeviceNet	15565 K 🔺	✓ EtherNet/IP	446 K
InterBus-S	0 К 📃	∎ EtherNet/IP EDS File	16149 K
✓ Prof ibus-DP	1182 K	Modbus on Ethernet	0 K
✓ Ethernet	17040 K		
Description - The EtherNet/IP pro 2 or level 4 (IO Mess Space Required C:	tocol is used age) on an Eth	to connect EtherNet/IP devi ernet network.)7496 K	ces level
Space Available C:	34	10284 K	

- (8) Complete the installation.
- (9) The message to ensure the restart appears. Click the Yes button.
- (10)Start the C:\Install\FieldBus\Install\SP\Setup.EXE and install the service pack. No installation is necessary when a service pack is not attached to controller.
- (11)After completing the installation of the service pack, shutdown the computer.
- (12) Proceed to 2.9.4 Board Installation.

2.9.4 Board Installation

WARNING

Make sure that the power is turned OFF before installing/removing any boards or connecting/disconnecting any cables. Installing/removing any boards or connecting/disconnecting any cables with the power ON is extremely hazardous and may result in electric shock and/or malfunction of equipment.

(1) Configure the board address jumper (JP1) on each board. The board number must start with 1 consecutively. Refer to the following table for JP1 configuration.

Short Socket Board No.	C0	C1	C2
1	0: Short	0: Short	0: Short
2	1: Short	0: Short	0: Short
3	0: Short	1: Short	0: Short
4	1: Short	1: Short	0: Short
5	0: Short	0: Short	1: Short
6	1: Short	0: Short	1: Short
7	0: Short	1: Short	1: Short
8	1: Short	1: Short	1: Short

- (2) Install the board(s) in any available PCI slot in the controller.
- (3) Connect the board(s) to the Fieldbus.
- (4) Start the controller.
- (5) The Windows Hardware Wizard will display a message that the applicomIO board was found and prompt you to restart the computer. The applicomIO console application will automatically start for this first start after installation. Close this application for now and restart the controller.
- (6) Start the applicomIO console application.
- (7) Click the Add Board button on the upper left of the console window to add a board.



(8) The following dialog will appear.

Add New Board		? ×
Board 1: Board to Add Board Type : PCI/PCU-ETHIO Description : 1 Ethernet channel 10/100 Mb PC104/ISA Board Parameters DPRAM Base Address : 04000 Diagnostic and Manual Configuration »	Informations A PCI/PCU-ETHIO board correctly detected. Press Ok to add this one in your configuration.	
	OK Cancel Help	

Check that "PCI/PCU-ETHIO ("PCI-DVNIO" in case of DeviceNet, and ""PCI-DPIO" or "PCU-DPIO" in case of PROFIBUS-DP) is shown in the **Board Type:** box. Then, click the **OK** button.

When installing more than two fieldbus boards in the system, add all the boards using this dialog.

The following dialog will appear when no board is detected. Ensure that the board is correctly inserted and that the board configuration is correct.

Board 2:] Board 2:] Board to Add Board Type : ABSENT Description : PC104/JSA Board Parameters	Informations No board 2 was detected. Press the "Diagnostic and Manual Configuration" button to have more information or to manually configure this one.	
DPRAM Base Address : D4000 🔽	OK	

(9) Click the OK button. The following dialog will appear.

Protocol	Manufacturer		
EtherNet/IP	ODVA		
Modbus on Ethernet	Schneider Electric	chneider Electric	
None	NUTE		

Select EtherNet/IP from Protocol, and click the OK button.

(10)Click the OK button. The following dialog will appear.

P/IP: 000.000.000.000			
eneral Advanced			
Configuration : Static		•	
Name	Value	Unit	
E IP Address:			
applicomIOR channel IP Address	000.000.000.000		
_Gateway IP Address	000.000.000.000		
_Sub-Network Mask	255.255.255.000		
📮 DNS Server:			
Primary DNS Server Address	000.000.000.000		
Secondary DNS Server Address	000.000.000.000		
⊫ Domain Name			
⊫ Host Name			
Parameter Description :			
boost priori v			<u></u>
			7
			1
	<u>O</u> K	Gancel	Help

Configure the IP address for the EtherNet/IP board.

Select the IP address from Static, DHCP, or BOOTP at Configuration.

Do not select Flash Memory.				
TCP/IP: 000.000.000.000				
General Advanced				
Configuration :	Static 🔽			
Name	DHCP			
	BOOTP			
applicomIOR channel IP	Hash Memory Address 000.000.000			
Containing TD Address	000.000.000			

When you select Static, set the values for each item.

(11)After all the boards are added, the system should be restarted. Close the applicomIO Console application and click the **OK** button on the **Save modification** dialog. Click the **OK** button on the following dialog to restart Windows.

applicomIOF	R Console	<
i	You have to restart the PC in order to your new configuration takes effect on the applicomIO ₄ driver	
	CK OK	

(12)After restarting the system, continue with the following 2.9.5 Master Mode or 2.9.6 Slave Mode sections.

2.9.5 Master Mode

- (1) Ensure that the board is connected to the fieldbus. Then, start the applicomIO console application.
- (2) Register the device information (EDS file) that is necessary for the network setup. Select the [Equipment Library] tab at the center of the dialog's right side and click the **Add** icon.



- (3) Following dialog appears. Register the EDS file that is supplied from the device manufacturer.
 - (3)-1 Click Next button.

EDS Management	
	EDS
This Wizard allows you to add EDS files.	
〈 戻る(8)	(次へ切)) キャンセル ヘルプ

(3)-2 Specify the folder that EDS is stored, and click the Next button.

-Select the Location of the EDS				
 Add File(s) 				
C Add all the E	DS from the Directory	🗖 Look in Subfolders		
Directory or File Name :		Browse		
C:¥EPSN0200.eds				
The EDS files usable in the Con and click on Next button to inse	isole are registered in the ED in the EDS files in the base.	S base. Select the location of the file(s)		
The EDS files usable in the Con and click on Next button to inse	sole are registered in the ED rt the EDS files in the base.	IS base. Select the location of the file(s)		
The EDS files usable in the Con and click on Next button to inse	isole are registered in the ED rt the EDS files in the base.	IS base. Select the location of the file(s)		
The EDS files usable in the Con and click on Next button to inse	isole are registered in the ED rt the EDS files in the base.	IS base. Select the location of the file(s)		
	Status	Major Revision	Minor Revision	Vendor N
--	------------------	---------------------	-----------------	------------
EPSON RC170 EtherNet/IP Slave	Correctly added.	1	1	SEIKO E
•				<u> </u>
ist of the files added in the base. Clic	k on Next to com	plete the addition.	<u>V</u> iew Se	lected Fil
< 1	実る(B) 次パ	<u>(N)></u> 4	**>セル	ヘルブ
			~	~
 ck the Complete b	utton to	register 1	the EDS	file.

(3)-3 Check the device information in EDS, and click the Next button.

- (3)-The action is completed. < 戻る(B) 完了 キャンセル ヘルブ
- (4) Click the Network Detection tab on the center left of the console window.



(5) Click the Read Network Configuration button to display the Network Detection dialog and read in the devices on the fieldbus.



(6) Drag each device you want to scan from the Network Detection tab to the Master item in the list on the right.



(7) Following dialog appears.

794-AENT FLEX I/C	D Ethernet Adapter	×
General Chassis	Connections Online Parameters Module Informations Port Configuration EDS File	
Equipment Des	signation	
Topic Name :	TOPIC1-B	
Number :	DO1 Link Parameters Active Configuration :	▼
Comm		
	1	
Natural Duran		
- Network Proper	rties	
	Name Value Unit	
	FP Address 192168210.004	
Description :	Define address type: IP or host name.	
	J	<u> </u>
	Help OK	Cancel
		Qancer

Uncheck the Link Parameter box and assign a value from 1 to 127. This number is called as device ID and necessary to create SPEL+ programs. Click the OK button to complete the registration.

(8) After finishing devices registration, select File | Download in Flash to register the configuration in the fieldbus board.

applicomIOR console	
Eile Description Library Network Protocol Tools Item	ns ?
Configuration Manager	E 🔊 🔊
Save Ctrl+S	
1 Board(s) Initialization	□ - 2 [001] 192168.219.094 1794-AENT □ - 2 Item Configuration Topic Name:
Lownload in Flash J-ETHIO Erase Flash Memories EtherNet/IP	Flex-slot8
Export (PCDDE)	[00] 1/94-1010/0000/ A [01] [Empty] [02] [Empty]
Preferences	[03] [Empty] [04] [Empty]
Exit	[05] [Empty]

After a few seconds, the board s	s state will show green in the status of	41.
applicomIOR console		- U X
<u>File Description Library Network Protocol Tools</u>	ltems ?	
	i <u>e, * </u>	
	Ethernet: RJ45 Auto 10/100 Mb	
🖃 🚏 Description (CONFIG01)	🖻 🗒 [001] 192.168.219.094 1794-AENT	
🖻 💻 Boards configuration		
Board 1: PCI/PCU-ETHIO	In/a] 1794-AENT Revision 21	
DDE server parameters (PCDDE)	[00] 1794-IB10XOB6/A	
DAServer parameters	[01] [Empty]	
🖉 OPC server parameters	[D2] [Empty]	
· · · · · · · · · · · · · · · · · · ·	[03] [Empty]	
	[04] [Empty]	
	[06] [Empty] [07] [Empty]	
1794-AENT FLEX I/O Ethernet Adapter F		
- 10 Input/6 Output 24V DC, Sink/Source 1	17_1	
[Emoty]	.20	
	<u>-</u>	
Carpment Library WG Network Detection		
Add Device Group : TOPIC1-B.		
Configuration file for DAServer created.		all
Uutput Message View		
Ready Con	figured boards state : 1 F	IA //

After a few seconds, the board's state will show green in the status bar.

Now, the fieldbus board is ready to operate as a master. Close the applicomIO Console application.

2.9.6 Slave Mode

- (1) Ensure that the board is connected to the fieldbus. Then, start the applicomIO console application.
- (2) Double-click the "EtherNet/IP Local Slave" item.

applicomIOR console	
<u>File Description Library Network Protocol Tools Items ?</u>	
Ethernet: RJ45 Auto 10/100 Mb	
TCP/IP: 192.168.219.200	
#9 PB	
E-P Description (CONFIG01)	
E-B, Boards configuration	
E Board 1: PCI/PCU-ETHIO	
Protocol (TCP): EtherNet/IP	
DDE server parameters (PCDDE)	
Alerver parameters	

(3) The EtherNet/IP Local Slave property sheet will appear. Select the Number (device) ID, and check the "Active Configuration".

[000] EtherNet/IP Loc	cal Slave	×
General Configurat	tion Assembly Instances	
Equipment Desig	gnation	
Topic Name :	TOPIC1-A	
Number :	Active Confie	guration : 🔽
Comment :		4
	<u>QK</u> ancel	Help

(4) Click on the **Assembly Instance** tab. Configure how many inputs and outputs for the slave device. In this example, the Sizes and Instances of Input and Output are set as follows.

[Output]-[Instance]	: 001
[Output]-[Size]	: 256 (bytes)
[Input]-[Instance]	: 002
[Input]-[Size]	: 256 (bytes)
a of Configuration	Size is not ave

Value of Configuration | Size is not available for EPSON RC+. Set "0" (Words) for this box.

000] EtherNet/IP Local Slave					
General Configurat	ion Assembly Ins	tances			
Assembly Instan	ices				
	Instance	Size			
Output	001 🔽	256	Bytes		
Input	002 💌	256	Bytes		
Configuration	003 💌	0	Words		
Previous	<u>N</u> ext		<u>0</u> K	<u>C</u> ancel	<u>H</u> elp



Make sure that the input/output size settings do not exceed 14 kbytes in total. The input/output sizes of each node may be restricted depending on the master. For details of the permitted data size, refer to the respective manuals of the masters.

(5) Click OK.

(6) Drag EtherNet/IP Local Slave from Equipment Library to the Master item in the list on the right.

Window in step 5 appears. Configure by the procedures from step 7. You can create up to 32 Local Slaves if necessary.



(7) Select File | Download in Flash to register the configuration in the fieldbus board.



After a few seconds, the board's state will show green in the status bar.

	×
<u>File Description Library Network Protocol Tools Items ?</u>	
Element: RJ45 Auto 10/100 Mb	
Description (CONFIG01)	
E- 🚇 Boards configuration	
Board 1: PCL/PCU-ETHIO	
DDE concernence percentere (PCDDE)	
DAServer parameters	
OPC server parameters	
図 図 原 → ● 聞 Display all Nodes	
EtherNet/IP Local Slave	
🔁 🕂 🖶 EtherNet/IP Equipments	
I I I I I I I I I I I I I I I I I I I	
Equipment Library 100 Network Detection	
Add Device Group : TOPIC1-A.	
Configuration file for DAServer created.	31
	•
Output Message View	
Ready Configured boards state : (IF)	11

(8) Close the applicomIO console application.

(9) The default slave EDS file is created. The path is: C:\Program Files\Woodhead\Direct-link\ApplicomIO2.3\ConfigIO \Config01\applicomio.eds.

You may make a copy of the default slave EDS file and modify it to create your original EDS file if necessary.

Edit the copy of the slave EDS file using Notepad. You may want to change the VendName and ProductTypeStr.

Copy the EDS file to the system where the master is located. Add the new slave device to the master using the new EDS file.

(10)On the master system, scan the network for new devices. The new slave device should be detected.

Use the EDS file created in previous steps for the slave device.

2.10 EPSON RC+ Fieldbus I/O Installation

After you have created your fieldbus network and installed the scanner board(s) in your controller, you must configure the EPSON RC+ Fieldbus I/O option.

Before continuing, the fieldbus scanner boards must have the device configuration stored in the board's flash memory, as described in the chapter *Installation*. Otherwise, the fieldbus boards will function improperly and EPSON RC+ cannot control them.

See the 2. Installation to store the device configuration in the flash memory.

Fieldbus I/O Software Configuration

To configure Fieldbus I/O, select System Configuration from the Setup menu. Click the I/O Systems tab, then select Fieldbus I/O from the list and click the Configure button. The dialog shown below will be displayed.

Set the bus type, nan	ne, and board type	properly and click t	the Read Confi	guration button.
	/ //			8

Con	figure Fi	eldbus I/O			X
	Bus #	Bus Type	Name	Board Number	Add
	1	DeviceNet	Fbus1	1	S
					Delete
					<u>Read Configuration</u>
			ОК	Cancel	Help

Option	Description
Add	Click this button to add a Fieldbus.
Delete	Click this button to delete the last Fieldbus. It will be dimmed when the last Fieldbus is not selected or there are no Fieldbuses installed.
Bus Type	Click in the Bus Type field and click the arrow on the right side of the field to select the Fieldbus type.
Board Number	The Board Number field is automatically incremented. The boards must be configured to use this number. Boards are always numbered consecutively starting with 1.
Read Configuration	Use this button to read the Fieldbus configuration for the selected Fieldbus. You must read the configuration in order for EPSON RC+ to know the devices in the bus.

Before continuing, you must click the **Read Configuration** button for each bus. This instructs EPSON RC+ to read the device configurations. If the configuration for a board is ever changed, you must Read Configuration again.

3. Operation

This chapter contains information on how to use the Fieldbus I/O option after it has been installed.

3.1 Fieldbus I/O Addressing in SPEL⁺

Each of the Fieldbus I/O commands in SPEL+ refer to one device on the network. The bit number and port number parameters refer to inputs and outputs local to the device.

3.2 SPEL⁺ Fieldbus I/O Commands

All Fieldbus I/O commands begin with the same prefix: "FbusIO_". Here are the main commands. For details, please see the online help or SPEL⁺ Language Reference Manual.

FbusIO_GetBusStatus	Returns the status of the specified fieldbus.
FbusIO_GetDeviceStatus	Returns the status of the specified fieldbus device.
FbusIO_In	Returns the status of an 8 bit input port.
FbusIO_InW	Returns the status of a 16 bit input port.
FbusIO_IONumber	Returns the bit number of the specified Fieldbus I/O label.
FbusIO_Off	Turns an output off.
FbusIO_On	Turns an output on.
FbusIO_Out	Simultaneously sets 8 output bits.
FbusIO_OutW	Simultaneously sets 16 output bits.
FbusIO_Sw	Returns the status of one input bit.
FbusIO_SendMsg	Sends an explicit message to a device and returns the reply.

NOTE

Response times for Fieldbus I/O can vary and depend on several factors, including baud rate, scan rate, number and types of devices, number of SPEL+ tasks, communication error, etc. When the fastest and most consistent response times are required, please use EPSON Standard digital I/O, which incorporates interrupt driven inputs and outputs.

3.3 Outputs Off by Emergency Stop and Reset Instruction

You can configure the system so that all outputs including the fieldbus outputs will be turned off when the emergency stop occurs and when a Reset instruction is executed. For details of the configuration, refer to the chapter *SPEL+ Options* in the EPSON RC+ User's Guide.



A command that was issued just before an emergency stop can be executed after the emergency stop condition is cleared. If the outputs from the fieldbus involve risk, the "Outputs off during Emergency Stop" option should be enabled to remove all power to output devices when an emergency stop occurs.

3.4 Waiting for Input or Output Status

The SPEL+ Wait statement cannot be used for Fieldbus I/O. You can make your own function to handle this.

For example:

```
Function WaitFbusInput(bus As Integer, device As Integer,
bit As Integer, state As Integer)
Do
    If FbusIO_Sw(bus, device, bit) = state Then
    Exit Function
    EndIf
    Wait .01
    Loop
Fend
```

In the program example above, a Wait statement is used to prevent the task from using too much CPU. You can remove the Wait for faster response, but the task will use more CPU. You may also want to add a timeout or other checks.

3.5 Using FbusIO_SendMsg

FbusIO_SendMsg is used to send an explicit message to a device and return a reply. This command operates according to the protocol.

The syntax is as follows:

FbusIO_SendMsg bus, device, msgParam, sendBytes(), recvBytes()

There are two arrays passed to the function. The sendData array contains the data that is sent to the device in bytes. This array must be dimensioned to the correct number of bytes to send. If there are no bytes to send, you must use 0 as the parameter. The recvData array returns the response in bytes. This array is automatically re-dimensioned to the number of bytes received.

For DeviceNet, you need to initialize the sendData array with the command, class, instance, and attribute, as shown in the example below. Consult the documentation that came with the device for the values that can be used. The msgParam parameter value is always 0 for DeviceNet messages.

Here is an example for DeviceNet, EtherNet/IP:

```
' Send explicit message to the device
Byte sendData(5)
Byte recvData(10)
Integer i
sendData(0) = 14 ' Command
sendData(1) = 1 ' Class
sendData(3) = 1 ' Instance
sendData(5) = 7 ' Attribute
FbusIO_SendMsg 1, 1, 0, sendData(), recvData()
For i = 0 To UBound(recvData)
    Print recvData(i)
Next i
```

For PROFIBUS DP, you need to specify the service number in the msgParam parameter. Consult the documentation that came with the device for the services that are supported. Some services require 0 send bytes. In this case, use 0 for the sendBytes parameter.

Here is an example for PROFIBUS DP:

```
' Send message to Profibus device
Byte recvData(10)
Integer i
' Service 56 - read all inputs
' sendBytes = 0
FbusIO_SendMsg 2, 1, 56, 0, recvData()
For i = 0 To UBound(recvData)
    Print recvData(i)
Next i
```

3.6 Using Slave Mode

In slave mode, the EPSON RC+ system is a slave on the bus. Outputs from the master are inputs in EPSON RC+, and inputs to the master are outputs in EPSON RC+.

Uses for slave mode:

- External equipment can monitor data in the controller
- Remote control

To use the system in slave mode, perform the following basic steps:

- 1. Configure local slave on the Fieldbus scanner board. Refer to the *2. Installation* for instructions for the type of hardware you are using.
- 2. Design your application to handle requests from the Fieldbus master and return data or execute functions.

3.7 Remote Control Slave

If the controller will be remotely controlled by a Fieldbus master, your application must auto start and run in a continuous loop to service requests from the master. Use OnErr, Trap Error, Trap Emergency and Restart to accomplish this. Refer to the sample project for Fieldbus remote slave called *FieldbusRemoteSlave* that is included with EPSON RC+.

3.8 Devices available for Fieldbus I/O Option

The fieldbus I/O option operations were checked with the following devices.

NOTE

The following information about the devices is just for reference. This is not our guarantee of the proper operation of these devices.

DeviceNet Devices

Specifications	Model Number	Manufacturer
16-input module	TDN-8C0-108	Woodhead
8-output module	TDN-808-118	Woodhead
Intelligent I/O module	750-346	WAGO
4-channel digital input module	750-431	WAGO
4-channel digital output module	750-530	WAGO
Photo sensor	42GNP-9000-QD1	Allen-Bradley
Motor Driver I/F	JUSP-NS300	YASKAWA ELECTRIC
Motor Driver	SGDH	YASKAWA ELECTRIC
RC170 DeviceNet option	RC170	SEIKO EPSON

PROFIBUS DP Device

Specifications	Model Number	Manufacturer
16-input module	TDP-8C0-B18-02	Woodhead
16-output module	TDN-808-B18-02	Woodhead
Intelligent I/O module	750-343	WAGO
4-channel digital input module	750-431	WAGO
4-channel digital output module	750-530	WAGO
Motor Driver I/F	JUSP-NS500	YASKAWA ELECTRIC
Motor Driver	SGDH	YASKAWA ELECTRIC
RC170 PROFIBUS-DP option	RC170	SEIKO EPSON

3.9 Fieldbus I/O Response Performance

As mentioned previously, respond times for fieldbus I/O can vary and depend on several factors. The values in this section are shown for reference not for guaranteed performance.

DeviceNet

Test Environment





Evaluation

Signals with various pulse widths (every 5 msec) were input to the standard I/O input and the input module of the fieldbus I/O at 1 Hz. For 10 minutes (600 seconds), pulse widths of the received signals were measured at 125 kbps and 500 kbps.

Result

500 kbps: The input devices responded to 25-msec pulse. 125 kbps: The input devices responded to 30-msec pulse.

PROFIBUS DP

Test Environment

RC520 Controller:	Pentium III 850 MHz 128 MB memory
Fieldbus I/O:	PCI-DPIO board Master (station address: 0)
Baud rate:	12 Mbps, 9.6 kbps
Connected Slave:	Woodhead 16-inpout module (TDP-8C0-B18-02)
	Node address: 2

Connection Image



Evaluation

Signals with various pulse widths (every 5 msec) were input to the standard I/O input and the input module of the fieldbus I/O at 1 Hz. For 10 minutes (600 seconds), pulse widths of the received signals were measured at 12 Mbps and 9.6 kbps.

Result

12 Mbps: The input devices responded to 25-msec pulse. 9.6 kbps: The input devices responded to 80-msec pulse.

4. Troubleshooting

4.1 DeviceNet Troubleshooting

Exclusion

Every system has its special environment, conditions, specifications, and usages. This guide is provided as a general reference for troubleshooting a DeviceNet network. Every effort has been made to ensure the information is accurate. However, we do not guarantee the complete accuracy of the information and thus we decline any liability for damages or costs incurred by the use of this troubleshooting.

Before examining a problem on the network, please ensure that your established DeviceNet system satisfies network specifications. (Refer to this troubleshooting and the section 2.2 *DeviceNet Network Construction*.)

Tools

Prepare the following tools for troubleshooting.

- Philips screwdriver
- Flat-blade screwdriver

Tester



Using the Woodhead NetMeter (DeviceNet diagnostic tool) is a simple way to learn physical status of the DeviceNet network. For details of NetMeter, see Woodhead's Web site (http://www.mysst.com/diagnostics/NetMeter.asp).

4.1.1 Examining a Problem

4.1.1.1 Scanner Board Diagnostic LEDs

The DeviceNet board used with EPSON RC+ has two status display LEDs. The layout of the LEDs is shown in the following figure.

PCU-DVNIO



The Module/NetWork LED is on the left and the IO LED is on the right seen from the rear panel. These LED names are used in applicomIO Console application and this manual. Only in this troubleshooting section, general names of the status display of the DeviceNet device are used instead.

The Module/NetWork LED is expressed by the Network Status (NS) in this section.

The IO LED is expressed by the Module Status LED (MS) in this section.

4.1.1.2 Check Network Status

(1) Master Status: MS/NS LEDs

LED	Cole	or	L	ight Conditior	1
MS (Module Status)	Green	□ Red	□ ON	Blinking	□ OFF
NS (Network Status)	Green	□ Red	□ ON	Blinking	□ OFF

(2) Node Number of Absent Slaves

Absent slaves are disconnected from or not added to the network.

- 1. See the status flag regarding to the removal and addition if the master has status information.
- 2. See the MS/NE LEDs of all slaves if the master has no status information.

⁽³⁾ Absent Slave Status: MS/NS LEDs

LED	Со	lor		Light Conditio	n
MS (Module Status)	□ Green	□ Red	□ ON	Blinking	□ OFF
NS (Network Status)	Green	□ Red	□ ON	Blinking	□ OFF

(4) Physical Node Location of Absent Slave



(5) Error Occurrence Condition

□ Immediate occurrence (high reproducibility)

□ Rare occurrence (low reproducibility)

Master Unit LED		Error	Description [Reference]	
MS	NS	EII0	Description [Reference]	
Green Light ON	Green Light ON	Normal communication	- Normal condition	
Green Light ON	Green Light Blinking	During connection establishment	 Processing connection establishment (The NS LED will be ON in green in a few seconds.) Master function in stop state (When communication does not start, master analysis with NetMeter is required.) 	
Green Light ON	Red Light Blinking	Communication error	 [Refer to the section 4.1.2.1 Master: Communication Error.] Slave disconnected from the network (Remote I/O communication error) Slave not added to the network (Scan list collation error) Communications power supply OFF (Error detection after the communication establishment) 	
Green Light ON	Red Light ON	Busoff detection Duplicate MAC ID	 [Refer to the section 4.1.2.2 Master: Busoff Detection.] Busoff detection: Communication stopped due to critical error. Duplicate MAC ID: The MAC ID configuration was duplicated. (This error occurs only during unit start- up) 	
Green Light ON	Light OFF	Unestablished communication	 [Refer to the section 4.1.2.3 Master: Unestablished Communication.] No slave (Error detection before communication establishment) Communications power supply OFF (Error detection before the communication establishment) Duplicate MAC ID: The MAC ID configuration was duplicated. 	
Red Light Blinking	No Matter	Configuration error	 Master unit configuration error Refer to the respective device manuals. [Refer to the section 4.1.2.4 Master: Configuration Error.] When EPSON RC+ was configured as a master: Slave disconnected from the network (Remote I/O communication error) Slave not added to the network (Scan list collation error) Duplicate MAC ID: The MAC ID configuration was duplicated. 	
Red Light ON	No Matter	Module error	- Broken master unit \rightarrow Unit Replacement	
Light OFF	Green Light Blinking	Absent slave	 [Refer to the section 4.1.2.5 Absent Slave.] No slave (Error detection before communication establishment) Communications power supply OFF 	
Light OFF	Light OFF	Uninitialized network Absent slave	 [Refer to the section 4.1.2.6 Uninitialized Network.] Master unit start-up error No slave (Error detection before communication establishment) Communications power supply OFF 	

4.1.2 Problems and Countermeasures

Process Flowchart



Master Unit LED		Free	Description	
MS	NS	EIIOI	Description	
Green	Red Light	Communication	- Slave disconnected from the network	
Light ON	Blinking	error	(Remote I/O communication error)	
			- Slave not added to the network	
			(Scan list collation error)	
			- Communications power supply OFF	
		(Error detection after the communica		
			establishment)	

4.1.2.1 Master: Communication Error

4.1.2.1.1 Slave: Not Operating

	MS	NS
Master LED Condition	Green Light ON	Red Light Blinking
Absent Slave LED Condition	Light OFF	Light OFF

Process Flowchart



♦ Causes of Error

Possible Cause	Examination Mathod	Countermoscure
FOSSIBle Cause		Countermeasure
O Slave power OFF	Measure the power voltage of the slaves. (It should be within the range of sufficient voltage for the slave operation.) NOTE: For slaves operating with communications power supply, measure voltage at the DeviceNet connector.	Supply power to the slave.
O Broken unit	Slave unit replacement	Replace the broken slave unit with a new one.

4.1.2.1.2 Slave: Communication Error Detection / Busoff Detection / Not-added

	MS	NS
Master LED Condition	Green Light ON	Red Light Blinking
(1) Absent Slave LED Condition (Communication error detection)	Green Light ON	Red Light Blinking
(2) Absent Slave LED Condition (Pusoff detection)	Green Light ON	Red Light ON
(3) Absent Slave LED Condition (Slave not added to the network)	Green Light ON	Light OFF



٠	Causes of Error						
	Possible Cause	Examination Method	Countermeasure				
	Possible Cause O Disconnected terminating resistors O Cable disconnection O Disconnected connector O Disconnected signal wire O Loose connector O Loose signal wire	 Examination Method (1) Check that terminating resistors are connected to both ends of the network. (2) Measure resistance between signal wires with communications power supply OFF. → Normal: 50 to 70 Ω Measuring point: Connection of the trouble unit For detail, refer to the section 4.1.3.1 Connection Problem. Check for the connection of connectors and signal wires. 	Countermeasure Fix the problem. How to find the trouble point: Remove the terminating resistor on one end of the network. The trouble point is where resistance changes from 120 Ω. Connect the connectors and signal wires again.				
	O Voltage drop of	 → The connectors and signal wires should be firmly connected. Checkpoint: all nodes and all branch taps For details, refer to the section 4.1.3.2 Loose Connector and Signal Wire. Measure voltage of 	Check the voltage of the				
	communications power supply	 communications power supply at the unit with a trouble. → Normal: 11V or more between V+ and V- If the voltage is 11 to 14 V, the unit is a possible cause. Fix the problem on the unit. 	power supply. Calculate the current capacity of the cable and add more communications power supplies.				
	O Noise (external cause)	 Check the noise intrusion via the following paths (1) to (3). (1) Noise via DRAIN (FG) (2) Induced noise via communication cable (3) Communications power supply → For details, refer to the section 4.1.3.3 Noise Intrusion. 	Take countermeasures against noise.				
	O Broken unit	Replace the broken unit with a new one. → Verify whether the problem is fixed.	Replace the unit with a new one.				
	 No cause is identified. 	Identify the trouble point by dividing the network. → For details, refer to the section 4.1.3.4 Broken Unit Examination.					

Master Unit LED		Error	Description
MS	NS	EIIO	Description
Green	Red Light	Busoff detection	Communication stopped due to critical
Light ON	ON		error.
		Duplicate MAC ID	The MAC ID configuration was
			duplicated. (This error occurs only
			during unit start-up)

4.1.2.2 Master: Busoff Detection



Causes of Error

Possible Cause	Examination Method	Countermeasure
O Disconnected	(1) Check that terminating	Fix the problem.
terminating resistors	resistors are connected to	1
O Cable disconnection	both ends of the network.	How to find the trouble
O Disconnected	(2) Measure resistance between	point:
connector	signal wires with	Remove the terminating
O Disconnected signal	communications power	resistor on one end of the
wire	supply OFF.	network. The trouble point
	\rightarrow Normal: 50 to 70 Ω	is where resistance
	• Measuring point: Connection	changes from 120 Ω .
	of the problem unit	0
	• For detail, refer to the section	
	4.1.3.1 Connection Problem.	
O Loose connector	Check for the connection of	Connect the connectors
O Loose signal wire	connectors and signal wires	and signal wires again
	\rightarrow The connectors and signal	und Signal Wiles again.
	wires should be firmly	
	connected	
	• Checkpoint: all nodes and all	
	branch taps	
	• For details refer to the section	
	4 1 3 2 Loose Connector and	
	Signal Wire	
O Voltage drop of	Measure voltage of	Check the voltage of the
communications	communications power supply at	power supply
power supply	the trouble unit	Calculate the current
ponersuppry	\rightarrow Normal: 11V or more between	capacity of the cable and
	V+ and V-	add more communications
	• If the voltage is 11 to 14 V, the	power supplies.
	unit is a possible cause. Fix the	rrr
	problem on the unit.	
O Noise	Check the noise intrusion via the	Take countermeasures
(external cause)	following paths (1) to (3).	against noise.
((1) Noise via DRAIN (FG)	
	(2) Induced noise via	
	communication cable	
	(3) Communications power	
	supply	
	\rightarrow For details, refer to the section	
	4.1.3.3 Noise Intrusion.	
O Broken unit	Replace the broken unit with a	Replace the unit with a
	new one.	new one.
	\rightarrow Verify whether the problem is	
	fixed.	
• No cause is	Identify the trouble point by	
identified.	dividing the network.	
	\rightarrow For details, refer to the section	
	4.1.3.4 Broken Unit	
	Examination.	

Master Unit LED		Error	Description
MS NS			Description
Green	Light	Master	Communications power supply OFF
Light ON	OFF	Unestablished	No slave
		communication	

4.1.2.3 Master: Unestablished Communication

Process Flowchart



• Causes of Error

Possible Cause	Examination Method	Countermeasure
O Voltage drop of	Measure voltage of	Check voltage of the power
communications	communications power supply at	supply.
power supply	the master unit.	
	\rightarrow Normal: 11V or more between	
	V+ and V-	
	• If the voltage is 11 to 14 V, the	
	master unit is a possible cause.	
	Fix the problem on it.	
O Disconnected	(1) Check that terminating	Fix the problem.
terminating	resistors are connected to	
resistors	both ends of the network.	How to find the trouble
O Cable	(2) Measure resistance between	point:
disconnection	signal wires with	Remove the terminating
ODisconnected	communications power	resistor on one end of the
O Discomposted	Supply OFF.	is where register as
O Disconnected	\rightarrow Normal: 50 to /0 Ω	is where resistance
signal wife	• Measuring point: Connection	changes from 120 Ω.
	• For detail refer to the section	
	4.1.3.1 Connection Problem	
O Loose connector	Check for the connection of	Connect the connectors
\bigcirc Loose signal wire	connectors and signal wires	and signal wires again
C LOOSE Signal with	\rightarrow The connectors and signal	and signal wires again.
	wires should be firmly	
	connected	
	• Checkpoint: Between the	
	master and its slaves	
	• For details, refer to the section	
	4.1.3.2 Loose Connector and	
	Signal Wire.	
O All slaves power	Measure the power voltage of the	Supply power to the slaves.
OFF	slaves. (It should be within the	
	range of sufficient voltage for	
	slave operation.)	
O Master unit	(1) Start applicomIO Console	Change the configuration.
configuration	application and check that the	
C C	configuration has no	
	difference with the network	
	condition.	
	(2) Check that the configuration	
	data were written in flash.	
	• For details, refer to the section	
	4.1.3.6 EPSON RC+ Master	
	Configuration.	

Master Unit LED		Error	Description
MS	NS	EIIU	Description
Red	No	Configuration error	- Slave disconnected from the network
Light	Matter	Slave error	(Remote I/O communication error)
Blinking		detection	- Slave not added to the network (Scan list
			collation error)
			- Duplicate MAC ID: The MAC ID
			configuration was duplicated.

4.1.2.4 Master: Configuration Error

Process Flowchart Check Check for master unit The problem is fixed. configuration (scan list configuration) □ No Problem No problem Check the following: - Unconnected terminating resistor - Unconnected or loose connector/signal wire Problem exists. (Fix it.) □ No Problem Cable disconnection See 4.1.3.1 and 4.1.3.2. No problem Problem exists. (Fix it.) Measure voltage of communications power supply □ No Problem No problem The problem is fixed. □ No Change Replace moving cable (Replace deteriorated cable) No change The problem is fixed. □ No Change Check for noise influence. See 4.1.3.3. No change The problem is fixed. Replace the master unit. □ No Change No change □ The trouble unit is not found. Rarely Does an error occur immediately? Immediately Divide the network and The unit is found. find the trouble unit. Replace the unit. The unit is not found. Yes Normal Communication? No Analyze the network with NetMeter. Consult the DeviceNet manufacturer.

Finish

• (Causes of Error
-----	-----------------

Possible Cause	Examination Method	Countermeasure
O Master unit	(1) Start applicomIO Console	Change the configuration.
configuration	application and check that the	
	configuration has no difference	
	with the network condition.	
	(2) Check that the configuration data	
	were written in flash.	
	(3) Check that the network load is	
	within allowable range.	
	• For details, refer to the section	
	4.1.3.6 EPSON RC+ Master	
O Discourse stad	(1) Charle that terminating projectors	Firsthe muchleur
O Disconnected	(1) Check that terminating resistors	Fix the problem.
registors	are connected to both ends of the	How to find the trouble
\cap Cable	(2) Measure resistance between signal	noint:
disconnection	wires with communications nower	Remove the terminating
O Disconnected	supply OFF	resistor on one end of the
connector	\rightarrow Normal: 50 to 70 O	network The trouble
O Disconnected	• Measuring point: Connection of the	point is where resistance
signal wire	trouble unit	changes from 120 Ω .
U U	• For detail, refer to the section	
	4.1.3.1 Connection Problem.	
O Loose connector	Check for the connection of connectors	Connect the connectors
O Loose signal	and signal wires.	and signal wires again.
wire	\rightarrow The connectors and signal wires	
	should be firmly connected.	
	• Checkpoint: all nodes and all branch	
	taps	
	• For details, refer to the section	
	4.1.3.2 Loose Connector and Signal	
	Wire.	
O voltage drop of	Measure voltage of communications	Check the voltage of the
communications	Normal: 11V or more between V	power supply.
power suppry	\rightarrow Normal. 11 V of more between V+	capacity of the cable and
	• If the voltage is 11 to 14 V the unit	add more communications
	is a possible cause. Fix the problem	nower supplies
	on the unit	power suppries.
O Noise	Check the noise intrusion via the	Take countermeasures
(external cause)	following paths (1) to (3).	against noise.
	(1) Noise via DRAIN (FG)	5
	(2) Induced noise via communication	
	cable	
	(3) Communications power supply	
	\rightarrow For details, refer to the section	
	4.1.3.3 Noise Intrusion.	
O Broken unit	Replace the broken unit with a new	Replace the unit with a
	one.	new one.
	\rightarrow verify whether the problem is	
	IACU. Identify the trouble point by dividing	
• INO Cause IS	the network	
	\rightarrow For details refer to the section	
	4.1.3.4 Broken Unit Examination	
L		1

4.1.2.5 Absent Slave

Master Unit LED		Error	Description
MS	MS NS		
Light	Green		- No slave (Error detection before
OFF	Light	Absent slave	communication establishment)
	Blinking		- Communications power supply OFF

Process Flowchart



◆ Causes of Error

Baabbe of Ellip		
Possible Cause	Examination Method	Countermeasure
O Voltage drop of	Measure voltage of	Check voltage of the power
communications	communications power supply at	supply.
power supply	the master unit.	11.5
From and From	\rightarrow Normal: 11V or more between	
	V+ and $V-$	
	• If the voltage is 11 to 14 V the	
	unit is a possible cause. Fix the	
	nroblem on the unit	
O Disconnected	(1) Check that terminating	Fix the problem
terminating	(1) Check that terminating	The problem.
registers	ands of the network	Harry to find the trouble
\cap C-11	(2) Magazing angistanga hatangan	How to find the trouble
	(2) Measure resistance between	point:
	signal wires with	Remove the terminating
O Disconnected	communications power supply	resistor on one end of the
connector	OFF.	network. The trouble point
ODisconnected	\rightarrow Normal: 50 to 70 Ω	is where resistance changes
signal wire	• Measuring point: Connection of	from 120 Ω .
	the master	
	• For detail, refer to the section	
	4.1.3.1 Connection Problem.	
O Loose connector	Check for the connection of	Connect the connectors and
O Loose signal wire	connectors and signal wires.	signal wires again.
	\rightarrow The connectors and signal	
	wires should be firmly	
	connected.	
	• Checkpoint: Between the master	
	and its slaves	
	• For details, refer to the section	
	4.1.3.2 Loose Connector and	
	Signal Wire.	
O All slaves power	Measure the power voltage of the	Supply power to the slaves.
OFF	slaves.	
	(It should be within the range of	
	sufficient voltage for the slave	
	operation.)	
O Master unit	(1) Start applicomIO Console	Change the configuration.
configuration	application and check that the	
e	configuration has no	
	difference with the network	
	condition.	
	(2) Check that the configuration	
	data were written in flash	
	• For details refer to the section	
	4 1 3 6 EPSON RC+ Master	
	Configuration	
	2011/15/11/01/1.	

Master Unit LED		Error	Description
MS	NS	EIIOI	Description
Light OFF	Light OFF	Uninitialized network	- Master unit start-up error
		Absent slave	- No slave (Error detection before
			communication establishment)
			- Communications power supply OFF

4.1.2.6 Uninitialized Network

Process Flowchart


◆ Causes of Error

Possible Cause	Examination Method	Countermeasure
O Voltage drop of	Measure voltage of	Check voltage of the power
communications	communications power supply at	supply.
power supply	the master unit.	
	\rightarrow Normal: 11V or more between	
	V+ and V-	
	• If the voltage is 11 to 14 V, the	
	master unit is a possible cause.	
	Fix the problem on it.	
O Disconnected	(1) Check that terminating	Fix the problem.
terminating resistors	resistors are connected to	1
O Cable disconnection	both ends of the network.	
O Disconnected	(2) Measure resistance between	How to find the trouble
connector	signal wires with	point:
O Disconnected signal	communications power	Remove the terminating
wire	supply OFF.	resistor on one end of the
	\rightarrow Normal: 50 to 70 Ω	network. The trouble point
	• Measuring point: Connection	is where resistance
	of the master	changes from 120 Ω .
	• For detail, refer to the section	e
	4.1.3.1 Connection Problem.	
O Loose connector	Check for the connection of	Connect the connectors
O Loose signal wire	connectors and signal wires.	and signal wires again.
C	\rightarrow The connectors and signal	
	wires should be firmly	
	connected.	
	• Checkpoint: Between the	
	master and its slaves	
	• For details, refer to the section	
	4.1.3.2 Loose Connector and	
	Signal Wire.	
O All slaves power	Measure the power voltage of the	Supply power to the slaves.
OFF	slaves.	11.5.1
-	(It should be within the range of	
	sufficient voltage for slave	
	operation.)	
O Master unit	(1) Start applicomIO Console	Change the configuration.
configuration	application and check that	
5	the configuration has no	
	difference with the network	
	condition.	
	(2) Check that the configuration	
	data were written in flash.	
	• For details, refer to the section	
	4.1.3.6 EPSON RC+ Master	
	Configuration	
L		1

4.1.3 Procedures for Examining Possible Causes

4.1.3.1 Connection Problem (Disconnected Terminating Resistors, Cable Disconnection, Disconnected Connector, Disconnected Signal Wire)

- (1) Ensure that two terminating resistors are connected to both ends of the network.
- (2) Turn OFF the communications power supply.
- (3) Measure resistance between CAN_H and CAN_L wires of the absent slave using the tester.



Resistance	Determination
0 Ω	Shot circuit
Under 50 Ω	Three or more terminating resistors on one network
50 to 70 Ω	Normal
70 to 120 Ω	Error (cable disconnection or disconnected signal wire on the
	trunk line)
Over 120 Ω	Error (cable disconnection or disconnected signal wire on drop
	line or trunk line \rightarrow Both CAN_H and CAN_L)

- (4) How to find the trouble point:
 - Remove the terminating resistor on one end of the network. (The resistance at the point where the terminating resistor is connected is 120 Ω .)
 - Measure resistance at branch taps of all units.
 - The trouble point is where resistance changes from 120Ω .
 - After finding the trouble point, verify the connector and cable conditions.

Process Flowchart



(2) Cable disconnection, etc.

4.1.3.2 Loose Connector and Signal Wire

Check for the connections of the following parts on the connector and cable.

(1) Crimp Terminal



(2) Connection of connector and signal wire



(3) Connection of connector and unit (T-branch tap)



4.1.3.3 Noise Intrusion

Verify how an error occurrence condition changes while taking the following countermeasures.

- ♦ Ground of FG (DRAIN) wire
 - Normal Grounding: Ground the DeviceNet network at only one point.





Disconnect the wire between V- and FG when you cannot ground the FG wire.



Countermeasure 2: Disconnect the shield wire to isolate it from the ground.

When noise intrudes the ground line because a noise source such as an inverter is installed near the communications power supply, disconnect the shield wire of the communication cable and isolate it from the ground to restrain noise intrusion.



Induced noise via communication cable

Separate the DeviceNet signal wire from the other wires (especially power wires).

* Separate the signal wire from the power wires 300 mm or more.



During site inspection, bypass the wire that is possibly affected by induced noise with other cables and then lay the cables. Establish the communication under no induced noise condition and verify whether an error occurs.

Communications Power Supply

When sharing one power source with the communications power supply and I/O devices, provide respective power sources separately.

Separating power source prevents noise caused by I/O device operations from affecting communication.





4.1.3.4 Broken Unit Examination (Dividing Network Examination)

When you cannot quickly find the trouble point due to a broken unit, connection failure including loose connector, or cable partial disconnection, divide the network to find the trouble point. Verify how error occurrence conditions change while taking the following countermeasures.

How to Examine

Divide the network to find which node is the cause of the problem.

Verify that a master can establish communications with the slaves even though one slave is separated from the network.

After finding the problem node, check the cables connected to it and replace the unit.

How to Divide

To divide the network, follow either procedure described below depending on the cable layout.

- (1) Separating each block from the network Divide the network by block and check each block.
 - 1. Ensure that the master has no problem by connecting it to its slaves one by one. (MS/NS: green light ON)
 - Divide the network in the middle of it and check for the communication condition. (MS/NS: green light ON) Normal: The trouble point is on the other half of the network. Error: The trouble point is on the current half of the network. (Continue dividing the half of the network further to distinguish error part from normal part.)
 - 3. Check for communication on the block to specify the trouble point.



(2) Separate each slave from the network

Check for each slave. The trouble point is where error condition changes into normal condition.



4.1.3.5 Network Configuration and Specifications

 Maximum Network Length and Drop Line Length Check that the cables used on the network meet the following specifications.

Tuno	Paud Data	Max. Network	Drop Line	Total Drop	
туре	Dauu Rale	Length	Length	Line Length	
Thick Cable	500 kbps	100 m		39 m	
	250 kbps	250 m		78 m	
	125 kbps	500 m	6 m	156 m	
Thin Cable	500 kbps	100 m	0 111	39 m	
	250 kbps	100 m		78 m	
	125 kbps	100 m		156 m	

(2) Terminating Resistor

Ensure that two terminating resistors are connected to both ends of the network (trunk line). The terminating resistor should be $121 \Omega 1/4$ W.

(3) Cable and Branch Tap

The cables and branch taps should meet the DeviceNet specifications.

(4) Communications Power Supply

The communications power supply should be dedicated to DeviceNet. Do not share power source with the communications power supply and I/O device. *

* Noise due to load on/off may affect DeviceNet communications via the communications power supply.

(The noise causes remote I/O communication error, Busoff detection, and broken unit.)

4.1.3.6 EPSON RC+ Master Configuration

For details of EPSON RC+ master configuration, refer to the section 2.5 DeviceNet Board Installation.

The following section describes the procedure for verifying the scanner board condition with applicomIO Console application.

4.1.3.6.1 Verifying applicomIO Console application condition

The status bar at the bottom of the window shows the applicomIO Console application status. The status bar varies as shown below:

Character: The address number of the scanner board is indicated with characters. When the character "F" appears, the flash memory on the board initialized the scanner board.

Background color: The background color indicates the scanner board status. For details, refer to the table below.

BackgroundCharacterStatusGrayBlackAccess to scanner board was failed.After that, the status bar will not be renewed automatically. To renew the status bar, right-click the status bar and select Refresh.MagentaBlackThe scanner board was initialized with an earlier version applicomIO Console application. It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application.RedBlackThe scanner board was not initialized. Initialize the scanner board to use it.YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the currently opened configuration. (Different version, etc.)Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.)It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened		,	
GrayBlackAccess to scanner board was failed.After that, the status bar will not be renewed automatically. To renew the status bar, right-click the status bar and select Refresh .MagentaBlackThe scanner board was initialized with an earlier version applicomIO Console application. It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application.RedBlackThe scanner board was not initialized. Initialize the scanner board to use it.YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the currently opened configuration. (Different version, etc.)GreenBlackThe scanner board was initialized, it is different than the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.	Background	Character	Status
After that, the status bar will not be renewed automatically. To renew the status bar, right-click the status bar and select Refresh.MagentaBlackThe scanner board was initialized with an earlier version applicomIO Console application. It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application.RedBlackThe scanner board was not initialized. Initialize the scanner board to use it.YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.)Dark greenBlackThe scanner board was initialized, it is different than the current version applicomIO Console application. This status happens only during network detection, on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.)GreenBlackThe scanner board was initialized properly and it is no different with the currently opened	Gray	Black	Access to scanner board was failed.
automatically. To renew the status bar, right-click the status bar and select Refresh .MagentaBlackThe scanner board was initialized with an earlier version applicomIO Console application. It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application.RedBlackThe scanner board was not initialized. Initialize the scanner board was not initialized. The scanner board was not initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. (Different version, etc.)GreenBlackThe scanner board was initialized, it is no different with the currently opened configuration. (Different version, etc.)GreenBlackThe scanner board was initializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.			After that, the status bar will not be renewed
Image 1Image 1the status bar and select Refresh.MagentaBlackThe scanner board was initialized with an earlier version applicomIO Console application.It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application.RedBlackThe scanner board was not initialized. Initialize the scanner board to use it.YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.)It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. (Different version, etc.)It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			automatically. To renew the status bar, right-click
MagentaBlackThe scanner board was initialized with an earlier version applicomIO Console application. It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application.RedBlackThe scanner board was not initialized. Initialize the scanner board to use it.YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			the status bar and select Refresh .
Image: space of the space of	Magenta	Black	The scanner board was initialized with an earlier
It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application.RedBlackThe scanner board was not initialized. Initialize the scanner board to use it.YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			version applicomIO Console application.
Into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application.RedBlackThe scanner board was not initialized. Initialize the scanner board to use it.YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			It is recommended that the scanner board be written
board) again with the current version applicomIO Console application.RedBlackThe scanner board was not initialized. Initialize the scanner board to use it.YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			into the flash memory (reinitializing the scanner
RedBlackThe scanner board was not initialized. Initialize the scanner board to use it.YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			board) again with the current version applicomIO
RedBlackThe scanner board was not initialized. Initialize the scanner board to use it.YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			Console application.
YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened	Red	Black	The scanner board was not initialized.
YellowBlackThe scanner board was partially initialized. This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			Initialize the scanner board to use it.
This status happens only during network detection and on-line actions.Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened	Yellow	Black	The scanner board was partially initialized.
Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			This status happens only during network detection
Dark greenWhiteAlthough the scanner board was initialized, it is different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			and on-line actions.
different than the currently opened configuration. (Different version, etc.) It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened	Dark green	White	Although the scanner board was initialized, it is
GreenBlackBlackThe scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackBlackThe scanner board was initialized properly and it is no different with the currently opened			(Different than the currently opened configuration.
It is recommended that the scanner board be written into the flash memory (reinitializing the scanner board) again with the current version applicomIO Console application. This status happens only during network detection, on-line actions, and diagnostic.GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			
Green Black Black The scanner board was initialized properly and it is no different with the currently opened			It is recommended that the scanner board be written
Green Black Black The scanner board was initialized properly and it is no different with the currently opened			heard) again with the surrent version applicable
Green Black The scanner board was initialized properly and it is no different with the currently opened			Consolo application
GreenBlackThe scanner board was initialized properly and it is no different with the currently opened			This status happens only during network detection
Green Black The scanner board was initialized properly and it is no different with the currently opened			on line actions, and diagnostic
no different with the currently opened	Green	Black	The scanner board was initialized properly and it is
no unrefer with the currently opened	Ulcell	DIACK	no different with the currently opened
contiguration			configuration
This status hannens only during network detection			This status happens only during network detection
on-line actions, and diagnostics			on-line actions and diagnostics

4.1.3.6.2 Verifying the DeviceNet network condition

The applicomIO Console application has a network diagnostic function (Diagnostic). The procedure for using the Diagnostic is described below.

(1) Open the Diagnostic window, click the magnifying grass button, and select the "Channel" on the device tree in the left side of the window. The window changes as shown below.

Negrostic Board : 1	
Diagnostic ?	
(ou Q	
Board 1 PCI_DVNID	Channel Information Rx: 0 Bytes 0 Frames/s Tx: OverRun: 0 Errors: 1 Warning Level Bus Off: Bus Off: 0 Baud rate: 500 KBit/s Bus Load: 100 % Current: 0.00 % Min: 0.00 % O % 0 % CAN DeviceNet (scanner)
International	

The **CAN** and **DeviceNet (scanner)** tabs appear on the data display in the right side of the window.

The CAN controller status of the scanner board is displayed on the CAN tab.

Rx :	Number of receive data bytes and flames
Tx :	Number of send data bytes and flames
OverRun :	Number of communication overrun errors detected by CAN
	controller
Errors :	Number of communication errors detected by CAN controller
Bus Off :	Number of Busoff detections
Baud Rate	: baud rate
Bus Load:	Load on the bus (maximum, minimum, current)

NOTE

Use DeviceNet so that the load on a bus is under 60% of the maximum load. When the load exceeds 60%, the DeviceNet network communication will be unstable. (For example, more communication errors) For the procedure for master configuration, refer to respective master device

manuals. For EPSON RC+ master configuration, refer to the section 2.5.5 *Master Mode*.



applicomR Status

(2) Select the **DeviceNet (Scanner)** tab. The window changes as shown below.

The scanner board status is shown in the "Code No. => Comment" form. The code numbers are shown in the following table.

Scanner board status

:

Status Code		Descriptions		
General	Protocol	Descriptions		
0		No fault detected. The function was performed		
	4	correctly.		
	4	Inaccessible data.		
		Additional information:		
		The remote device is in error.		
		Check its status.		
32		Indicates that the parameters passed to the functions		
		are not correct (eg: Number of requested variables		
		too large)		
	33	Response time-out fault.		
		Additional information:		
		The device does not answer. Check its status and the		
		wiring.		
		The DeviceNet master has no device to be scanned in		
		its configuration.		
	34	Physical defect on the line.		
		Additional information:		
		No +24V power supply was detected.		
		The CAN component of the applicomIO® interface		
		is "Bus Off".		
		Check the network wiring and Baud Rate.		
36		Device not configured.		
		Define the device configuration with the		
		applicomIO® Console and re-initiate the		
		initialization of the applicomIO® product by running		
		the PcInitIO		

Status Code		Descriptions
General	Protocol	Descriptions
45		Non-resident dialogue software.
		Additional information:
		Initialize the applicomIO® interface before use by
		running the PcInitIO
47		Targeted applicomIO® card invalid or incorrectly
		initialized by the function IO_Init
	53	Synchronization problem on the line.
		Additional information:
		The DeviceNet master is "off line" (power supply
		not detected or the CAN component of the
		applicomIO [®] is "Bus Off")
		Check the network wiring and Baud Rate.
	55	Response time-out exceeded.
		Additional information:
		The device accepted the connection but did not
		answer the request.
		Check the device status.
	65	Connection denied.
		Additional information:
		Connection to the DeviceNet master is in progress
		or refused by the device.
	70	Connection finished.
		Additional information:
		Duplication of MAC ID detected on the DeviceNet
		network.
		Modify the MAC ID of the DeviceNet master.
	79	Profile incompatible.
		Additional information:
		The device does not match the configuration.
		Check the device identity and the connection sizes.
63		Indicates that a communication error has been
		encountered on serial Port.
66		Not enough applicomIO® interface memory.
93		Driver cannot be accessed.
99		Indicates that applicomIO [®] solution is already
		running.
255	•	Indicates that the local input buffer was not updated
		beforehand by the function IO RefreshInput.

(3) When you click the **I/O** button on the upper left of the window, the window changes as shown below.

Nagnostic Board : 1	
Diagnostic ?	
₽ 1/0 ??	
	Channel Information
Board I PULDVNIU	0 1 2 3 4 5 6 7
Channel 0 : DEVICENET	000000
	8 9 10 11 12 13 14 15
Equipment N*:2	
Equipment N 13	24 25 26 27 28 29 30 31
	32 33 34 35 36 37 38 39
	0000000
	40 41 42 43 44 45 46 47
	0000000
	48 49 50 51 52 53 54 55
	0000000
	56 57 58 59 60 61 62 63
	0000000
	ZZ Previous Nevt N
	COLONIAR HOURY
applicom	

Each slave device status is shown in the right side of the window. A green circle indicates that the communication of the corresponding device is normal, and a red circle indicates that there is a communication error. A gray circle indicates that the corresponding device does not exist.

(4) When you select "Equipment" on the device tree in the left side of the window, the window changes as shown below.

-	- Equipment informations
Board 1 PCL_DVNI0 Channel 0 : DEVICENET Channel 0 : DEVICENET Equipment N*:2 Equipment N*:3	Equipment informations Input Mapping (in Byte): Output Mapping (in Byte): Output Mapping (in Byte): Output Value : Hex O Winte Input Lenght (Bytes): 2 Output Lenght (Bytes): 1 applicomR Status : No synchronous on bus

The input and output statuses of the selected device are shown in the right side of the window.

If you want to change output data, click the byte number you want to change in the **Output Mapping** box. Then, enter a value in the **Write** box in the "Selected Output Value" and click the **Write** button.

4.2 PROFIBUS DP Troubleshooting

Exclusion

Every system has its special environment, conditions, specifications, and usages. This guide is provided as general reference for troubleshooting a PROFIBUS DP network. Every effort has been made to ensure the information is accurate. However, we do not guarantee the complete accuracy of the information and thus we decline any liability for damages or costs incurred by the use of this troubleshooting.

Before examining a problem on the network, please ensure that your established PROFIBUS DP system satisfies network specifications. (Refer to this troubleshooting and the section 2.4 *PROFIBUS DP Network Construction*.)

Tools

Prepare the following tools for troubleshooting.

Philips screwdriver

Flat-blade screwdriver

Tester

4.2.1 Examining a Problem

4.2.1.1 Scanner Board Diagnostic LEDs

The PROFIBUS DP board used with EPSON RC+ has two status display LEDs. The layout of the LEDs is shown in the following figure.

PCU-DPIO



The Communication Status LED is on the left and the Physical Error LED is on the right seen from the rear panel.

The Communication Status LED is expressed by the ST LED (ST) in this section.

The Physical Error LED is expressed by the BF LED (BF) in this section.

4.2.1.2 Check Network Status

First of all, you should check the current condition of the network. There are different specifications of status display LED on a device in the PROFIBUS DP standard. This section explains how to check the network status assuming that EPSON RC+ is configured as a master or slave.

(1) Master Status: BF/ST LEDs

LED	Color		Light Condition			
BF (Physical error)	□ Green □ Red		□ ON	Blinking	□ OFF	
ST (Communication Status)	Green	□ Red	□ ON	Blinking	□ OFF	

(2) Station Number of Absent Slaves

Absent slaves are disconnected from or not added to the network.

- 1. See the status flag regarding to the removal and addition if the master has status information.
- 2. See the BF/ST LEDs of all slaves if the master has no status information.

(3) Absent Slave Status: BF/ST LEDs

LED	Color		Light Condition			
BF (Physical error)	sical error)		□ ON	Blinking	□ OFF	
ST (Communication Status)	Green	□ Red	□ ON	Blinking	□ OFF	

(4) Physical Node Location of Absent Slave



(5) Error Occurrence Condition

□ Immediate occurrence (high reproducibility)

□ Rare occurrence (low reproducibility)

4.2.2 Problems and Countermeasures

Master Unit LED		Error	Description [Peference]	
BF	ST	EIIOI	Description [Reference]	
Light OFF	Green Light Blinking	Normal communication	- Normal condition	
Light OFF	Green Light ON	Ready for communication	- Normal condition	
Light OFF	Red Light Blinking	Communication error	[Refer to the section 4.2.2.1 Master Communication Error.] - Slave disconnected from the network (Remote I/O communication error) - Slave not added to the network (Scan list collation error)	
			- Nonstandard wiring	
			- No or too many terminating resistors	
			- Noise intrusion	
Light OFF	Red Light ON	Data link layer error	[Refer to the section 4.2.2.2 Master: Data Link Layer Error.]	
			- Nonstandard wiring	
			- Noise intrusion	
Light OFF	Light OFF	Uninitialized network	[Refer to the section 4.2.2.3 Master: Uninitialized Network.]	
			- Master unit power error	
			- Master unit configuration error	
Red Light ON	No Matter	Physical error	[Refer to the section <i>4.2.2.4 Master: Configuration Error.</i>]	
			- Nonstandard wiring	
			- Signal wire connection failure	
			- Signal wire short circuit	

Process Flowchart



Master Unit LED		Error	Description	
BF	ST	EIIOI	Description	
Light OFF	Red Light Blinking	Communication error	 Slave disconnected from the network (Remote I/O communication error) Slave not added to the network (Scan list collation error) Nonstandard wiring No or too many terminating resistors Noise intrusion 	

4.2.2.1 Master: Communication Error

4.2.2.1.1 Master/Slave: Communication Error

	BF	ST
Master LED Condition	Light OFF	Red Light Blinking
Absent Slave LED Condition	Light OFF	Green Light Blinking
(Communication error)	Light OFF	Red Light Blinking



♦ Causes of Error

Possible Cause	Examination Method	Countermeasure
O Disconnected	(1) Check that terminating	Fix the problem.
terminating	resistors are connected to	-
resistors	both ends of the network.	How to find the trouble
O Cable	(2) Measure resistance between	point:
disconnection	signal wires with device	Remove the terminating
O Disconnected	power supply OFF.	resistor on one end of the
connector	\rightarrow Normal: 100 to 120 Ω	network. The trouble point
O Disconnected	 Measuring point: Connection 	is where resistance changes
signal wire	of the trouble unit	from 220 Ω.
	• For detail, refer to the section	
	4.2.3.1 Connection Problem.	
O Loose connector	Check for the connection of	Connect the connectors and
O Loose signal wire	connectors and signal wires.	signal wires again.
	\rightarrow The connectors and signal	
	wires should be firmly	
	connected.	
	• Checkpoint: all stations and all	
	• For details, refer to the section	
	• For details, refer to the section	
	4.2.5.2 Loose Connector and Signal Wire	
O Flectrical surges of	Measure voltage of device power	Check voltage of the device
device nower	supply at the trouble unit	nower supply
supply	\rightarrow It should be within the range	power suppry.
suppry	of sufficient voltage for device	
	operation.	
O Noise	Check the noise intrusion via the	Take countermeasures
(external cause)	following paths (1) to (3).	against noise.
	(1) Noise via shield	
	(2) Induced noise via	
	communication cable	
	(3) Device power supply	
	\rightarrow For details, refer to the section	
	4.2.3.3 Noise Intrusion.	
O Broken unit	Replace the trouble unit with a	Replace the unit with a new
	new one.	one.
	\rightarrow Verify whether the problem is	
	fixed.	
• No cause is	Identify the trouble point by	
identified.	dividing the network.	
	\rightarrow For details, refer to the section	
	4.2.3.4 Broken Unit	
	Examination.	

4.2.2.1.2 Slave: Data Link Error

	MS	NS
Master LED Condition	Light OFF	Red Light Blinking
Absent Slave LED Condition		D - 1 L - 14 ON
(Data link error)	Light OFF	Ked Light ON

Process Flowchart



♦ Causes of Error

Possible Cause	Examination Method	Countermeasure
O Disconnected	(1) Check that terminating	Fix the problem.
terminating resistors	resistors are connected to	
O Cable disconnection	both ends of the network.	How to find the trouble
O Disconnected	(2) Measure resistance	point:
connector	between signal wires with	Remove the terminating
O Disconnected signal	device power supply OFF.	resistor on one end of the
wire	\rightarrow Normal: 100 to 120 Ω	network. The trouble point
	• Measuring point: Connection	is where resistance changes
	of the trouble unit	from 220 Ω.
	• For detail, refer to the section	
	4.2.3.1 Connection Problem.	
O Loose connector	Check for the connection of	Connect the connectors and
O Loose signal wire	connectors and signal wires.	signal wires again.
	\rightarrow The connectors and signal	
	wires should be firmly	
	connected.	
	• Checkpoint: all stations and	
	all branch taps	
	• For details, refer to the	
	section 4.2.3.2 Loose	
	Connector and Signal Wire.	
O Noise	Check the noise intrusion via	Take countermeasures
(external cause)	the following paths (1) to (3).	against noise.
	(1) Noise via shield	
	(2) Induced noise via	
	communication cable	
	(3) Device power supply	
	\rightarrow For details, refer to the	
	section 4.2.3.3 Noise	
O Dullar it	Intrusion.	Desile and a set of the second
O Broken unit	Replace the trouble unit with a	Replace the unit with a new
	new one.	one.
	\rightarrow verify whether the problem	
• Na anna ia	IS IIXed.	
 No cause is identified 	dividing the network	
identified.	Larviang the network.	
	\rightarrow FOI details, refer to the	
	Section 4.2.5.4 Broken Unit	
	Examination.	

ST

Finish

ΒF

	Master LED Condition	Light OFF	Red Light Blinking
	Absent Slave LED Condition (Uninitialized Network)	Light OFF	Light OFF
♦ Process Flowchart <u>Check</u>	(4)		
No Problem	Measure voltage of all slave power supplies.	roblem exists. (Fix it.)	
	No problem		
No Problem	Check the following: Unconnected terminating resistor reconnected or loose connector/signal wire Cable disconnection	Problem exists. (Fix it.) See 4.2.3.1 and	4.2.3.2.
□ No Change <	Replace moving cable. (Replace deteriorated cable).	he problem is fixed.	
	No change Replace the unit.		
□ No <	Normal Communication?	es	

4.2.2.1.3 Slave: Uninitialized Network

No

Consult the PROFIBUS manufacturer.

Causes of Error

Possible Cause	Examination Method	Countermeasure
O Electrical surges of	Measure voltage of device	Check voltage of the device
device power supply	power supply at the trouble	power supply.
	unit.	
	\rightarrow It should be within the range	
	of sufficient voltage for	
	device operation.	
O Disconnected	(1) Check that terminating	Fix the problem.
terminating resistors	resistors are connected to	
O Cable disconnection	both ends of the network.	How to find the trouble
O Disconnected	(2) Measure resistance	point:
connector	between signal wires with	Remove the terminating
O Disconnected signal	device power supply OFF.	resistor on one end of the
wire	\rightarrow Normal: 100 to 120 Ω	network. The trouble point
	 Measuring point: Connection 	is where resistance changes
	of the trouble unit	from 220 Ω.
	• For detail, refer to the section	
	4.2.3.1 Connection Problem.	
O Loose connector	Check for the connection of	Connect the connectors and
O Loose signal wire	connectors and signal wires.	signal wires again.
	\rightarrow The connectors and signal	
	wires should be firmly	
	connected.	
	• Checkpoint: all stations and	
	all branch taps	
	• For details, refer to the	
	section 4.2.3.2 Loose	
	Connector and Signal Wire.	
O Broken unit	Replace the trouble unit with a	Replace the unit with a new
	new one.	one.
	\rightarrow Verify whether the problem	
	is fixed.	

		BF	ST
	Master LED Condition	Light OFF	Red Light Blinking
	Absent Slave LED Condition (Physical error)	Red Light ON	No Matter
 Process Flowchart 			
<u>Check</u>	5		

4.2.2.1.4 Slave: Physical Error



Causes of Error

Possible Cause	Examination Method	Countermeasure
O Electrical surges of device power supply	Measure voltage of device power supply at the trouble unit. → It should be within the range of sufficient voltage for device operation.	Check voltage of the device power supply.
O Broken unit	Replace the trouble unit with a new one. \rightarrow Verify whether the problem is fixed.	Replace the unit with a new one.

Master Unit LED		Error	Description	
BF	ST		•	
Light OFF	Red Light ON	Data link layer error	Nonstandard wiringNoise intrusion	

4.2.2.2 Master: Data Link Layer Error

Process Flowchart



Possible Cause	Possible Cause Examination Method	
O Disconnected	(1) Check that terminating resistors are connected to	Fix the problem.
O Cable disconnection	both ends of the network	How to find the trouble
O Disconnected	(2) Measure resistance between	point.
connector	signal wires with device	Remove the terminating
O Disconnected signal	nower supply OFF	resistor on one end of the
wire	\rightarrow Normal: 100 to 120 O	network The trouble point
	Measuring point: Connection	is where resistance
	of the trouble unit	changes from 220 Ω
	• For detail refer to the section	
	4.2.3.1 Connection Problem.	
O Loose connector	Check for the connection of	Connect the connectors
O Loose signal wire	connectors and signal wires.	and signal wires again.
E .	\rightarrow The connectors and signal	
	wires should be firmly	
	connected.	
	• Checkpoint: all stations and all	
	branch taps	
	• For details, refer to the section	
	4.2.3.2 Loose Connector and	
	Signal Wire.	
O Noise	Check the noise intrusion via the	Take countermeasures
(external cause)	following paths (1) to (3).	against noise.
	(1) Noise via shield	
	(2) Induced noise via	
	communication cable	
	(3) Device power supply	
	\rightarrow For details, refer to the section	
O Dullar it	4.2.3.3 Noise Intrusion.	
O Broken unit	Replace the trouble unit with a	Replace the unit with a
	Norify whather the problem is	new one.
	\rightarrow verify whether the problem is	
No cause is	Identify the trouble point by	
- identified	dividing the network	
iuoniniou.	\rightarrow For details refer to the section	
	4 2 3 4 Broken Unit	
	Examination	
	DAMININUUUI.	

◆ Causes of Error

Master Unit LED		Error	Description
BF	ST	EIIU	Description
Light OFF	Light OFF	Uninitialized network	 Master unit power error Master unit configuration error

4.2.2.3 Master: Uninitialized Network

Process Flowchart



♦ Causes of Error

Possible Cause	Examination Method	Countermeasure
O Electrical surges of master device power supply	Measure voltage of device power supply at the master unit. → It should be within the range of sufficient voltage for device operation.	Check voltage of the device power supply.
O Master device configuration error	Check that the master device was configured properly. → After changing the configuration, verify whether the problem is fixed.	Check the master unit configuration.
O Broken master unit	Replace the broken master unit with a new one. → Verify whether the problem is fixed.	Replace the master unit with a new one.

Master	Unit LED	Error	Description		
BF	ST		Description		
Red Light ON	No Matter	Physical error	- Nonstandard wiring - Signal wire connection failure - Signal wire short circuit		

4.2.2.4 Master: Configuration Error

Process Flowchart



Possible Cause	Examination Method	Countermeasure
O Disconnected	(1) Check that terminating	Fix the problem.
terminating	resistors are connected to both	
resistors	ends of the network.	How to find the trouble
O Cable	(2) Measure resistance between	point:
disconnection	signal wires with device	Remove the terminating
O Disconnected	power supply OFF.	resistor on one end of the
connector	\rightarrow Normal: 100 to 120 Ω	network. The trouble point
O Disconnected	• Measuring point: Connection of	is where resistance changes
signal wire	the trouble unit	from 220 Ω.
_	• For detail, refer to the section	
	4.2.3.1 Connection Problem.	
O Loose connector	Check for the connection of	Connect the connectors and
O Loose signal wire	connectors and signal wires.	signal wires again.
C	\rightarrow The connectors and signal	
	wires should be firmly	
	connected.	
	• Checkpoint: all stations and all	
	branch taps	
	• For details, refer to the section	
	4.2.3.2 Loose Connector and	
	Signal Wire.	
O Broken unit	Replace the trouble unit with a	Replace the unit with a
	new one.	new one.
	\rightarrow Verify whether the problem is	
	fixed.	
• No cause is	Identify the trouble point by	
identified.	dividing the network.	
	\rightarrow For details, refer to the section	
	4.2.3.4 Broken Unit	
	Examination	

Causes of Error

4.2.3 Procedures for Examining Possible Causes

4.2.3.1 Connection Problem (Disconnected Terminating Resistors, Cable Disconnection, Disconnected Connector, Disconnected Signal Wire)

- (1) Ensure that two terminating resistors are connected to both ends of the network.
- (2) Turn OFF all device power supplies.
- (3) Measure resistance between A1 and B1 wires of the absent slave using the tester.



Measure resistance between signal wires with tester.

Resistance	Determination	
0 Ω	Shot circuit	
Under 100 Ω	Three or more terminating resistors on one network	
100 to 120 Ω	Normal	
Over 120 Ω	Error (cable disconnection, disconnected signal wire, one or	
	zero terminating resistor)	

- (4) How to find the trouble point:
 - Remove the terminating resistor on one end of the network.
 - (The resistance at the point where the terminating resistor is connected is 220 Ω .)
 - Measure resistance at branch taps of all units.
 - The trouble point is where resistance changes from 220 Ω .
 - After finding the trouble point, verify the connector and cable conditions.

Process Flowchart



4.2.3.2 Loose Connector and Signal Wire

Check for the connections of the following parts on the connector and cable.

(1) Connection of connector and signal wire



4.2.3.3 Noise Intrusion

Verify how error occurrence condition changes while taking the following countermeasures.

Ground of FG wire

Normal Grounding: Peel the cable covering and ground the FG wire.



Turn ON the terminating resistor at the end of the network.

Secure the clamps to the intermediate plate of the board with screws to ground the shield.
Countermeasure 1: Improve FG.



Countermeasure 2: Disconnect the FG wire to isolate it from the ground.

When noise intrudes the ground line because a noise source such as an inverter is installed near the grounding point, disconnect the shield wire of the signal cable and isolate it from the ground to restrain noise intrusion.



Induced noise via communication cable

Separate the PROFIBUS DP signal wire from the other wires (especially power wires).

* Separate the signal wire from the power wires 300 mm or more.



During site inspection, bypass the wire that is possibly affected by induced noise with other cables and then lay the cables. Establish the communication under no induced noise condition and verify whether an error occurs.

4.2.3.4 Broken Unit Examination (Dividing Network Examination)

When you cannot quickly find the trouble point due to broken unit, connection failure including loose connector, or cable partial disconnection, divide the network to find the trouble point. Verify how error occurrence conditions change while taking the following countermeasures.

How to Examine

Divide the network to find which station is a cause of a trouble.

Verify that a master can establish communications with the slaves even though one slave is separated from the network.

After finding the trouble station, check the cables connected to it and replace the unit.

How to Divide

Divide the network by block and check each block.

- 1. Ensure that the master has no problem by connecting it to its slaves one by one. (BF/ST: light OFF/green light ON or blinking)
- Divide the network in the middle of it and check for the communication condition. (BF/ST: light OFF/green light ON or blinking) Normal: The trouble point is on the other half of the network. Error: The trouble point is on the current half of the network. (Continue dividing the half of the network further to distinguish error part from normal part.)
- 3. Check for communication on the block to specify the trouble point.



4.2.3.5 Network Configuration and Specifications

(1) Maximum Cable Length

Check that the cables used on the network meet the following specifications.

Baud Rates	Max. Cable Length
12 Mbps	100 m
6 Mbps	100 m
3 Mbps	100 m
1500 kbps	200 m
500 kbps	400 m
187.5 kbps	1000 m
93.75 kbps	1200 m
19.2 kbps	1200 m
9.6 kbps	1200 m

(2) Terminating Resistor

Ensure that two terminating resistors are connected to both ends of the network. The terminating resistor should be connected as shown below.

(3) Cable

The cables should meet the PROFIBUS specifications.

Item	Property
Impedance	135 to 165 Ω
Capacity	< 30 pf/m
Loop resistance	110 Ω/km
Wire diameter	0.64 mm
Core cross-section	> 0.34mm ²

4.2.3.6 EPSON RC+ Master Configuration

For details of EPSON RC+ master configuration, refer to the section 2.6 PROFIBUS DP Board Installation.

The following section describes the procedure for verifying the scanner board condition with the applicomIO Console application.

4.2.3.6.1 Verifying applicomIO Console application condition

The status bar at the bottom of the window shows the applicomIO Console application status. The status bar varies as shown below:

Character: The address number of the scanner board is indicated with characters. When the character "F" appears, the flash memory on the board initialized the scanner board.

Background color: The background color indicates the scanner board status. For details, refer to the table below.

Background	Character	Status
Gray	Black	Access to scanner board was failed.
		After that, the status bar will not be renewed
		automatically. To renew the status bar, right-click
		the status bar and select Refresh .
Magenta	Black	The scanner board was initialized with the earlier
		version applicomIO Console application.
		It is recommended that the scanner board be written
		into the flash memory (reinitializing the scanner
		board) again with the current version applicomIO
		Console application.
Red	Black	The scanner board was not initialized.
		Initialize the scanner board to use it.
Yellow	Black	The scanner board was partially initialized.
		This status happens only during network detection
Deen eneen	White	Although the generate board was initialized it is
Deep green	white	Although the scanner board was initialized, it is different with the currently opened configuration
		(Different version_etc.)
		It is recommended that the scanner board be written
		into the flash memory (reinitializing the scanner
		board) again with the current version applicomIO
		Console application.
		This status happens only during network detection,
		on-line actions, and diagnostic.
Green	Black	The scanner board was initialized properly and it is
		no different with the currently opened configuration.
		This status happens only during network detection,
		on-line actions, and diagnostic.

4.2.3.6.2 Verifying the PROFIBUS DP network condition

The applicomIO Console application has the following functions:

Network Monitor function: Monitoring error condition detected on the network

Diagnostic function: Network diagnosis

(1) Select the **Network Detection** tab in the left center of the applicomIO Console application.

applicomIOR console	
<u>File Description Library Network Protocol Tools</u>	Items ?
Elle Description Library Network Protocol Jools Protocol Post Post	Items 2 → PROFIBUS Master - Station: 000 - 12 Mbit/s → 0 [002] Station: 002 TPD-800-B18-02 → 0 [003] Station: 003 TPD-800-B18-02 → 0 [None] Local DP Slave
Loading description files complete	
Loading configuration mes	
🛄 Output Message View	
Ready	Configured boards state : 1 F

(2) Click the **Online Action** button. The **Network Monitor** dialog appears.

Inline Action					ŶX
Network Monitor Se	t Slave Address				
000 _ 002 003					
, Tokon Error :					
TOKEN EITOP .	ų			- E	7.8
Address Error :	0				
Timeout Error:	1	Network Cycle :	61689		
Frame Error :	0	Bus Fault :	1		i _e
			Help	<u>0</u> K	<u>C</u> ancel

You can check the conditions of the following errors on this dialog.

Token ErrorAddress ErrorTimeout Error

Frame Error Network Cycle Bus Fault

When an error occurs on the network, it is added to the corresponding error counter.

(3) Select the **Protocol** | **Diagnostic** on the applicomIO Console application menu. Click the magnifying grass button on the **Diagnostic** window.

Then, select the slave you want on the device tree in the left side of the window. The window changes as shown below.

Diagnostic Board : 1	
Diagnostic ?	
Board 1 PCI_DPID Channel 0 : PROFIBUS Slave N*:2 -> DP Slave N*:3 -> DP	Equipment information Slave Information Master Address: SYNC Mode FREEZE Mode Watchdog Control Slave Device Diagnostic Identification Number: Decimal: [1552 Hexadecimal: [61A Configuration Display modules
international	

To check the device condition in detail, click the **Diagnostic** button in the Equipment information group box in the right side of the window. If an error occurs, the information is displayed in red.

C C C C C C C C C C C C C C C C C C C	Master Lock Parameter Fault Invalid Slave Response Not Supported Extended Diag Configuration Fault Station not Ready Station non Existent anded Diag		Slave Deactivated Reserved SYNC Mode FREEZE Mode Watchdog Dn Slave Device Static Diag Parameter Req Used	00000000	Ext Diag Overflow Reserved Reserved Reserved Reserved Reserved Reserved Reserved
Devi	ice Related Diagnostic : 0x00 0x	00 Ox	00 0x00 0x00 0x00	-	A
	-				V
applic	om nternational			[<u> </u>
Old Exte	ented Status : 0				

Pagnostic Board : 1	
Diagnostic ?	
P 10 ?	
Board 1 PCL DPI0	Equipment information
	0 1 2 3 4 5 6 7
Channel 0 : PROFIBUS	00000000
	8 9 10 11 12 13 14 15
Slave N*:3>DP	00000000
	24 25 26 27 28 29 30 31
	00000000
	32 33 34 35 36 37 38 39
	40 41 42 43 44 43 46 47
	48 49 50 51 52 53 54 55
	00000000
	56 57 58 59 60 61 62 63
	<< Previous Next >>
applicom	
International	

(4) When you click the **I/O** button, the window changes as shown below.

The status of each slave device is shown in the right side of the window. A green circle indicates that the communication of the corresponding device is normal, and a red circle indicates that there is a communication error. A gray circle indicates that the corresponding device does not exist.

(5) When you select the slave on the device tree in the left side of the window, the window changes as shown below.

Le Diagnostic Board : 1	
Diagnostic ?	
P I/0 🔇	
Board 1 PC_DPIO	Equipment informations Input Mapping (in Byte) : Output Mapping (in Byte) : O Selected Output Value : Hex Uput Lenght (Bytes) : Output Lenght (Bytes) : Output Lenght (Bytes) : Papping Status : Exchange OK 1
applicom	

The input and output statuses of the selected device are shown in the right side of the window.

If you want to change output data, click the bite number you want to change in the **Output Mapping** box. Then, enter a value in the **Write** box in the "Selected Output Value" and click the **Write** button.

4.3 EtherNet/IP Troubleshooting

Exclusion

Every system has its special environment, conditions, specifications, and usages. This guide is provided as a general reference for troubleshooting a EtherNet/IP network. Every effort has been made to ensure the information is accurate. However, we do not guarantee the complete accuracy of the information and thus we decline any liability for damages or costs incurred by the use of this troubleshooting.

Before examining a problem on the network, please ensure that your established DeviceNet system satisfies network specifications. (Refer to this troubleshooting and the section 2.6 *EtherNet/IP Network Construction*.)

4.3.1 Examining a Problem

4.3.1.1 Scanner Board Diagnostic LEDs

The EtherNet/IP board used with EPSON RC+ has two status display LEDs. The layout of the LEDs is shown in the following figure.

PCU-ETHIO



The Module/NetWork LED is on the left and the IO LED is on the right seen from the rear panel. These LED names are used in applicomIO Console application and this manual. Only in this troubleshooting section, general names of the status display of the DeviceNet device are used instead.

The Network Status LED is expressed by the NS LED (NS) in this section.

The Module Status LED is expressed by the MS LED (MS) in this section.

4.3.1.2 Check Network Status

(1) Master Status: MS/NS LEDs

LED	Color		L	ight Conditior	ו
MS (Module Status)	Green	□ Red	□ ON	Blinking	□ OFF
NS (Network Status)	Green	□ Red	□ ON	Blinking	□ OFF

(2) Node Number of Absent Slaves

Absent slaves are disconnected from or not added to the network.

- 1. See the status flag regarding to the removal and addition if the master has status information.
- 2. See the MS/NE LEDs of all slaves if the master has no status information.
- (3) Absent Slave Status: MS/NS LEDs

LED	Color			Light Conditio	n
MS (Module Status)	□ Green	□ Red	□ ON	Blinking	□ OFF
NS (Network Status)	□ Green	□ Red	□ ON	Blinking	□ OFF

(4) Physical Node Location of Absent Slave



(5) Error Occurrence Condition

□ Immediate occurrence (high reproducibility)

□ Rare occurrence (low reproducibility)

Master I	Jnit LED	Бинен	Description [Deference]
MS	NS	Error	Description [Reference]
Green Light ON	Green Light ON	Normal communication	- Normal condition
Green Light ON	Green Light Blinking	During connection establishment	 Processing connection establishment (The NS LED will be ON in green in a few seconds.) Master function in stop state (Communication does not start.)
Green Light ON	Red Light Blinking	Communication timeout	- Network channel error
Green Light ON	Light OFF	IP address not defined	- The IP address is not defined
Red Light Blinking	No Matter	Critical error	[Refer to the section <i>4.3.3 Tests and diagnostics.</i>] - Unrecoverable critical error
Red Light ON	No Matter	Module error	[Refer to the section <i>4.3.3 Tests and diagnostics.</i>] - Recoverable error occurred
Light OFF	No Matter	error	 [Refer to the section 4.1.2.5 Absent Slave.] No slave (Error detection before communication establishment) Communications power supply OFF
Light OFF	Light OFF	Not initialized status	[Refer to the section 2.9.5 Master Mode and 2.9.6 Slave Mode.] - The communication board is not initialized Check the configuration

4.3.3 Tests and diagnostics

4.3.3.1 The diagnostic tool

After configuring the EtherNet/IP master, adding and configuring the devices of your network and downloading your configuration in the board, the statuses of all devices can be tested with the diagnostic tool.

tart this tool with the menu command "**Protocol/Diagnostic...**" or with the **b**utton.

See also: To display the help, select [Start]-[Program]-[Direct-Link]-[applicomIO 2.3]-[Help].

4.3.3.1.1 Ethernet/IP channel on Ethernet diagnostics

The EtherNet/IP on Ethernet channel diagnostic information can be displayed by selecting the MULTI-MSG ETH channel.



All devices in the configuration are visualized by a LED corresponding to the applicomIO device number.

The LED may be red or green depending on the device error status.

1. Diagnostic of the TCP/IP layer

This screen is used to display the exchange statuses regarding the TCP/IP layer.

🧏 Diagnostic Board : 2	
Diagnostic Tools ?	
Q 1/2 Q	
Board 2 PCI_ETHIO Channel 0: ETHERNET/IP Channel 0: ETHERNET/IP Cayer TCP/IP Server Equipments 31: [128.127.56.31] [EtherN	Informations TCP/IP Configuration Type : Static Address From : Configuration IP Address : I28127.56.122 Sub-Network Mask : S255.255.0 Gateway IP Address : 0.0.0.0 Primary DNS Address : 0.0.0.0 Frimary DNS Address : 0.0.0.0 Host Name : Domain Name : CETCP EP Address

Configuration Type	Mode type selected in the configuration: DHCP, BOOTP,
	Static
Address From	How the IP address has been obtained, from the server,
	flash memory or factory address.
IP address	IP address of the applicomIO master on this channel.
Sub-Network Mask	Sub-network address of the applicomIO master on this
	channel.
Gateway IP Address	Address of the gateway configured on the applicomIO
	master on this channel.
Primary DNS Address	IP Address of the primary DNS server.
Secondary DNS Address	IP address of the secondary DNS server.
Host Name	Host name of the applicomIO master on this channel.
Domain Name	Domain name of the applicomIO® master on this channel.

TCP tab

	0	
Actives conn	ections :	
	1	
Currents con	nections :	
	1	
Bytes receive	ed .	
	674	
Bytes transmi	ited :	
	1034	
Time-out retra	ansmitted :	
	0	

Passive connections Active connections Current connections Bytes received Bytes transmitted Retries on time-out

IP tab

Packets rece	ived : 13080	
Packets tan	smitted :	
	10124	
Errors :	0	
		Address

Packets received Packets transmitted Errors

Number of packets received. Number of packets transmitted. Number of IP errors.

Number of passive connections.

Number of active connections.

Number of current connections.

Number of bytes received.

Number of bytes transmitted.

Number of retries on reception of a time-out.

2. Diagnostic of server devices

Diagnostic Board : 2	
Board 2 PCI_ETHIO	Server equip informations Request : 50505 Request : 198,00 Data bytes : 1706877 Data bytes : 1772,00 Error requests : 0 Advanced
< >	

Requests	Number of requests.
Requests / s	umber of requests per second.
Useful bytes	Number of useful data bytes.
Useful bytes / s	Number of useful data bytes per second.
Requests in error	Number of requests in error.

3. Overall device diagnostics

View the diagnostic information on a device in the configuration by selecting the node which corresponds to the device.



IP Address	IP address of the device.
From	How the IP address of the device was obtained:
	from the configuration
	from the DNS server (IP address of the device has been resolved)
Requests	Number of requests.
Requests / s	Number of requests per second.
Useful bytes	Number of useful data bytes.
Useful bytes / s	Number of useful data bytes per second.
Connections	Number of connections created for this device.
Time-out errors	Number of time-outs received for this device.
Frame errors	Number of frame errors for this device.
Refusal errors	Number of errors excluding time-out and frame errors.

4.3.3.1.2 TCP/IP tool

By clicking in the button and selecting "TCP/IP layer", a "services" window gives you the following options.

DNS

ICMP (ping)

See also: To display the help, select [Start]-[Program]-[Direct-Link]-[applicomIO 2.3]-[Help].

1. Resolution of IP address or name

DNS functionality is available on the applicomIO solution. It is available through the diagnostic tool, DNS tab.

🞐 Diagnostic Board : 2	
Diagnostic Tools ?	
Q 100 Ø 🕄	
Board 2 PCI_ETHIO	Services Address: Host Name: Description: Clear Clear Clear Status: Stop On Enor: Clear Clear
< >	DNS ICMP

(1) Selects the type of resolution to be carried out.

IP Address: the host name is obtained from the IP address.

Host Name: the IP address is obtained from the host name.

- (2) Carries out a resolution.
- (3) Status: Status of resolution carried out
 - 0 : No error
 - 33 : Response time-out exceeded
 - 132 : Negative reply from DNS server (SERVER FAILURE, etc.)

2. Ping

ICMP ECHO "**PING**" functionality is available on the applicomIO solution. It is available through the diagnostic tool, ICMP tab.



(1) Entry field for the IP address or name of the remote station.

(2) Field showing result obtained:

- Status 0	: The station is present and has responded (the response time is
	given in the Time column)

- Status 33 : The station is not present

(3) Command field:

Clear	: Clears the list of results
Ping	: Sends a PING command
Loop	: Executes PING command in a loop
Stop on Error	: If Loop has been selected, stops if an error has occurred
Status	: Status of the PING request
	0 ·OK

- 33 : TIME-OUT
- 132: Resolution error

5. Maintenance Parts List

Part Name	Code	Specifications
DeviceNet board	R13B040701	
PROFIBUS DP board	R13B040702	
EtherNet/IP board	R12B040719	

Appendix A applicomIO Upgrade

- (1) Start the controller
- Insert the setup CD that is packaged with the product to the CD-Rom drive on the controller. Setup program starts automatically.
- (3) Select the desired language for the installer.
- (4) Select Products Installation.



- (5) Select Installation.
- (6) Select applicomIO. Do not select applicomIO ActiveX.



- (7) Following dialog appears. Select the option above.
 - (If the option below is selected, the transition of the current setting will not be executed.)



(8) Uninstall the current applicomIO before upgrading. Following dialog appears. Click the **OK** button.



Following dialog appears. Check the [Don't display this message] box and click the **Yes** button.

Shared File Detected	×
The file C:\Program Files\Common Files\Microsoft Shared\DAO\Dao2535.tlb may no longer be needed by an application. You can delete this file, but doing so prevent other applications from running correctly. : Yes to delete the file.	y may Select
Don't display this message	
<u>Y</u> es No	Cancel

(9) Install the default components.

Choose the compo	onents Setup wil	l install.	0
Select the compo want to install.	onents you want •	to install, clear the components you	u do no
DDE server		0 K SuiteLink,FastDDE	0 K
OPC server		0 K	
v Help files		0 К	
Description "DDE" server i DDE mode.	nstallation givi	ng access to applicomIDa interface	s in
Space Required	C:	70140 K	
	C•	3411844 K	

(10)Select the protocol and the device data file.

plicomIO 2.3		
Select protocols		
Select the protocols wi requires IMPERATIVELY t	th the scroll-bar . The installation c he right license.	f a protocol
🖌 DeviceNet	15565 K 🔺 🔽 DeviceNet Protocol	138 K 🔺
🗌 InterBus-S	0 K EDS Allen-Bradley.	7893 K 🖵
🖌 Profibus-DP	1182 K 🛛 🔽 EDS Banner Enginee	132 K
v Ethernet	17040 K 🚽 🗹 EDS Cutler-Hammer.	421 K
Description DeviceNet protocol co managed by 0.D.V.A (0	mmunication is based on CAN fieldbus a pen DeviceNet Vendor Association).	nd is
Space Required C:	107496 K	
Space Available C:	3411324 K	
applicomio	<u> </u>	Cancel

(11)Complete the installation.

- (12)The message to ensure the restart appears. Click the Yes button.
- (13) When a service pack is attached to the CD-ROM, install the service pack.
- (14)After completing the installation of the service pack, shutdown the computer.